AFRICAN RHINOCEROS

BIBLIOGRAPHY

Compiled by

ERICA VAN DER WESTHUIZEN

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AFRICAN RHINOCEROS BIBLIOGRAPHY

This bibliography was compiled at the request of the organisers of the Symposium on Rhinos as Game Ranch Animals, the Wildlife Group of the South African Veterinary Association and the Wildlife Research Programme of the Faculty of Veterinary Science, University of Pretoria

SOURCES

The following sources were used:

CAB Abstracts databases (1972 - 1994)

BIOSIS (1969 - 1994)

Zoological Record (1978 - 1994)

ISAP (Index to South African Periodicals)

SABINET (South African Bibliographic and Information Network)

WILDI , Heather: A bibliography of black rhinoceros Diceros bicornis Linnaeus 1758 and white rhinoceros Ceratotherium simum Burchell 1817 for Southern Africa, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31 - September 4, 1988.
Koedoe, 32(2), 1989. 89-123

MILLER , Eric : Veterinary bibliography for rhinoceroses. 1992. 55pp. St Louis: Saint Louis Zoo.

PROF BANIE PENZHORN of the Faculty of Veterinary Science, University of Pretoria and

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ARRANGEMENT

Entries are arranged alphabetically by author under main subject headings. Additional descriptors were allocated if necessary and items are listed alphabetically under these descriptors in a separate descriptor list.

There is also an author list.

Both the descriptor list and the author list have numbers allocated to each entry, to enable the user to distinguish between the entries.

Items from **Wildi's Bibliography** are indicated with an asterisk (*)and those from **Miller's Bibliography** with a hash (#).

The Veterinary Science Library of the University of Pretoria has many of the items listed and can be contacted at the address given below.

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COMPILER:
Mrs Erica van der Westhuizen
Information Specialist

Veterinary Science Library
University of Pretoria
Private Bag X04
0110 Onderstepoort
South Africa

E-Mail : Vetbib@OP1.UP.AC.ZA
Tel : 012 529-8007
Fax : 012 529 8302

CONTENTS

AGE

*DITTRICH, L On the eruption of milk premolars of the black rhino (Diceros bicornis) and the white rhino (Ceratotherium simum).
Säugetierkundliche Mitteilungen , 22(4), 1974. 289-295.
AGE; TEETH.

*DUNHAM, K Ages of black rhinos killed by drought and poaching in Zimbabwe.
Pachyderm, 5, 1985. 12-13.
AGE; TEETH; ZIMBABWE; ECOLOGY; POACHING.

*FOSTER, J B Mortality and ageing of black rhinoceros in East Tsavo park, Kenya.
East African Wildlife Journal, 3, 1965. 118-119.
AGE; TEETH; TSAVO NATIONAL PARK; MORTALITY.

*GODDARD, J A note on age at sexual maturity in wild black rhinoceros.
East African Wildlife Journal, 8, 1970. 205.
AGE; TEETH.

GODDARD J Age criteria and vital statistics of a black rhinoceros population.
East African Wildlife Journal, 8, 1970. 105-121.
DESCRIPTION; TEETH; HABITAT.

HILLMAN SMITH, A K K OWEN SMITH, N ANDERSON, J L HALL-MARTIN, A J SELALADI, J P Age estimation of the white rhinoceros Ceratotherium simum.
Journal of Zoology, A210(3), 1986. 355-380.
AGE; HORN; TEETH; SKULL; ANATOMY.
Age estimation criteria for the southern White rhinoceros (Ceratotherium simum simum) are presented both for free-ranging live animals and for cranial material. These are based on: (i) size appearance and horn development of live animals; (ii) stages of tooth eruption; (iii) tooth wear classes; (iv) attrition in height of the first molar tooth; (v) counts of cementum lines visible in tooth sections. Selected measurements are presented for live animals, skulls and horns. For live animals, eight size classes are distinguished, seven of these covering immature animals up to ten years of age. Sixteen tooth wear classes are established, based on eruption and surface wear of maxillary dentition. Chronological ages were assigned from individually known animals followed in the field, and from skulls from animals for which exact records of age were available, or which could be assigned to an age category from appearance at death. Cementum line counts corresponded approximately with age in years, despite difficulties in interpreting lines. Some variability was observed, possibly related to nutritional conditions. The maximum cementum line count obtained indicates a longevity of at least 40 years. Full body weight and socio-sexual maturity are attained by males between 10 and 15 years of age, while females first give birth between six and eight years of age. Sequences and times of tooth eruption are similar to those reported for the Black rhinoceros (Diceros bicornis). Comparative cranial and body measurements are presented for the northern subspecies (Ceratotherium simum cottoni). 171.

HITCHINS, P M Age determination of the black rhinoceros Diceros bicornis in Zululand South Africa.
South African Journal of Wildlife Research, 8(2), 1978. 71-80.
ZULULAND; TEETH.
Age criteria for the black rhinoceros based on tooth eruption and attrition were presented. Assignment of chronological ages to the classes was made by reference to known-age animals and to numbers of cementum lines in tooth section. The most reliable estimate of chronological age can probably be obtained from the counts of cementum lines in the 1st permanent molar. 285.

WUCHER, M A technique for making dental impressions and casts of immobilised black rhinoceros (Diceros bicornis) and white rhinoceros (Ceratotherium simum).
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 164-167 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
TEETH.

ANAESTHESIA

JENKINS, D H The use of etorphine (M99) and diprenorphine (M5050) for anesthesia in a white rhinoceros for the removal of growths on the third eyelid.
Auburn Veterinarian, 34(2), 1978. 39-43; 17 ref.
DRUGS.
Successful anaesthesia of a zoo rhinoceros with 2 mg etorphine is reported. Eosinophilic inflammatory polyps were removed from the nictitating membrane of one eye. After surgery 4 mg diprenorphine was given i/v to reverse the narcotic effect, and the animal made an uneventful recovery..

*LARSEN, L H Restraint and anaesthesia of wild animals in captivity.
Australian Veterinary Journal, 39, 1963. 73-80.
RESTRAINT.

#LEBLANC, P H EICKER, S W CURTIS, M BEEHLER, B Hypertension following etorphine anesthesia in a rhinoceros (Diceros simus).
Journal of Zoo Animal Medicine, 18, 1987. 141-143.
HYPERTENSION; VETERINARY MEDICINE AND SURGERY.

RAATH, J P Anaesthesia of the white rhino.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 119-127 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
IMMOBILISATION/DRUGS.

ANATOMY

*ALEXANDER, A *PLAYER, I C A note on the nuchal hump of the square-lipped rhinoceros, Ceratotherium simum simum (Burchell).
Lammergeyer, 3(2), 1965. 5-9.
ANATOMY.

*AUMONIER, F J *CAVE, A J E A note on the visceral histology of Ceratotherium.
Journal of the Royal Microscopical Society, 78(3/4), 1960. 120-122.
VISCERA; HISTOLOGY.

BOYDE, A Dependence of rate of physical erosion on orientation and density in mineralized tissues.
Anatomy and Embryology, 170(1), 1984. 57-62.
TEETH; ENAMEL; BONES; DENTINE; COLLAGEN.
Bone, dentine and enamel samples from man, African elephant white rhinoceros, black rhinoceros, sperm whale, kangaroo, koala bear, cattle, horse and rat were treated with a gas-propelled jet of an abrasive, NaHCO3, which is physically much softer than any of these tissues in their fully mineralized condition. It was found that they are all eroded by this treatment, which can therefore be used as a new kind of qualitative test of physical properties relating to war resistance. General correlations were found between both degree of mineralization and between structure orientation and erosion rate, surface-parallel-feature zones being worn more rapidly. Bone domains with surface-parallel collagen were eroded faster than those with perpendicular lamellae even if they were more densely mineralized. Rates of dentine wear depended on both density and tubule orientation, with peritubular zones and better mineralized incremental layers being more resistant. Enamel tufts wear more rapidly than the surrounding well mineralized regions. Enamel diazones wear less than parazones (areas with surface parallel prisms). At the prism scale, enamel is removed more rapidly near prism boundary discontinuities and in tubular enamel, at tubule walls. As regards the common orientation dependent effects seen in these 3 tissues, a cohesive explanation would be that structure discontinuities can be better exploited in a wear process if they allow cleavage from the surface; which tendency will increase parallelism to the surface. 203.

BOYDE, A FORTELIUS, M Development structure and function of rhinoceros enamel.
Zoological Journal of the Linnean Society, 87(2), 1986. 181-214.
ENAMEL; TEETH.
Vertical enamel prism decussation in the inner-layer enamel of rhinoceroses occurs as the result of vertical translation, in opposite senses, of zones and ameloblasts, which begins very shortly after amelogenesis commences at the enamel-dentine junction. Prisms in the centre of the decussating zones are stacked in the Pattern 3 arrangement. Zone boundary prisms adopt intermediate orientations, are locally nearly perpendicular to the enamel surface, and have a cylindrical, Pattern 1 cross-section. Decussation also continues in the outer-layer enamel, but the prisms all have occlusal-going courses: the occlusal-going zones of the inner enamel continue as the more occlusally oriented zones of the outer layer. Abrasion resistance to diamond polishing and soft abrasive projectile erosion (air-polishing with NaHCO3) and resistance to ion beam erosion is greater with distance from the nearest prism boundary discontinuity. Polished surface areas containing longitudinally sectioned prisms are more prone to 'air-polishing' and 'airbrading' erosion than areas with transversely sectioned prisms. These observed relationships fully explain the relief developed at natural wear surfaces. 187.

BOYDE, A TAMARIN, A Improvement to critical point drying technique for scanning electron microscopy.
Scanning, 6(1), 1984. 30-35.
SCANNING ELECTRON MICROSCOPY; ENAMEL.
An improved method was developed for dehydration and critical point drying CPD which leads to a marked reduction in morphological artefact in at least 2 classes of problematical specimen: rhinoceros fetal enamel and avian chick embryonic heads. Water is replaced by ethanol and ethanol by C2Cl3F3 by refluxing in a Soxhlet apparatus. Containers are designed to prevent air drying on transfer to the CPD bomb. Thorough removal of water and ethanol prior to CPD can reduce the types of artefact associated with post-CPD shrinkage (superdrying). 224.

BROUARD, P Lisbon's unusual zoo guest, a 3-horned black rhino (Diceros bicornis).
International Zoo News, 25(2), 1978. 12-13.
SKULL; HORN; LISBON ZOO; PARASITES; PORTUGAL; ZOOS.

CAVE, A J E Bi locular epipharyngeal bursa in Diceros bicornis.
Journal of Zoology, 174(2), 1974. 159-160.
BURSA.
Postmortem examination of the head and neck of an adult male Diceros revealed an exceptionally capacious and wide epipharyngeal bursa caudally extended no further than the foramen magnum. It occupied the customary infracranial, suprapharyngeal position. The bursa's lateral portion occupied the gutteral pouch (as in Equus), but had no morphological connection to the Eustachian tube. Laterally the bursa abutted the stylohyal. Interiorly a low, ventro-medial septum was present. No such septal division has been previously observed in Diceros. This epipharyngeal variation may be compared with a variation observed in Ailuropoda. 316.

*CAVE, A J E AUMONIER, F J Elephant and rhinoceros lymph-node histology.
Journal of the Royal Microscopical Society, 80(3), 1962. 209-214.
HISTOLOGY; LYMPH NODES.

*CAVE, A J E Lymph node structure in Diceros bicornis.
Journal of the Royal Microscopical Society, 82, 1963. 107-110.
LYMPH NODES; MORPHOLOGY.

*CAVE, A J E Note on rhinoceros salivary glands.
Journal of Zoology, 196(1), 1982. 53-61.
GLANDS; ANATOMY.

*CAVE, A J E Note on rhinoceros thyroid gland constitution.
Journal of Zoology, 179, 1976. 557-560.
THYROID GLAND; ANATOMY.

*CAVE, A J E Observations on the rhinoceros cardiac receptor system.
Journal of Zoology, 195, 1981. 243-254.
ANATOMY; PHYSIOLOGY.

*CAVE, A J E Observations upon rhinoceros cervical lymphatics.
Journal of Zoology, 185, 1978. 13-26.
ANATOMY.

*CAVE, A J E Pedal glands in the Rhinocerotidae.
Proceedings of the Zoological Society of London, 139, 1962. 685-690.
GLANDS; ANATOMY.

CAVE, A J E Pneumatic osteolysis in a cetacean orcaella brevirostris.
Journal of Zoology, 168(3), 1972. 299-308.
OSTEOLYSIS.

CAVE, A J E Post cava structure in elephant and rhinoceros.
Journal of Zoology, 176(4), 1975. 559-566.
ANATOMY.

*CAVE, A J E AUMONIER, F J Preputial skin and glands in Ceratotherium and Diceros.
Journal of the Royal Microscopical Society, 84(1), 1964.
SKIN; GLANDS.

CAVE, A J E The epipharyngeal bursa in the rhinocerotidae.
Journal of Zoology, 172(1), 1974. 133-145.
BURSA.

*CAVE, A J E The foramen ovale in the Rhinocerotidae.
Proceedings of the Congress of Zoology, 15, 1959. 419-421.
ANATOMY.

CAVE, A J E The major intrinsic pancreatic ducts of the rhinoceros.
Journal of Zoology, 214(3), 1988. 451-456.
PANCREATIC DUCTS; PANCREAS.
A first-time account is given of the parenchymal subdivisions and related duct system of the pancreas in Didermocerus, Diceros and Ceratotherium. In each of these rhinoceros forms a small, superficial portion only of the caput pancreatis is drained by a Santorini duct opening directly into the duodenum. The remainder of the pancreatic parenchyma is drained principally by a transverse and an ascending duct, from whose union arises a short Wirsung duct which enters the duodenum through an intermediary Vaterian ampulla situated within a prominent papilla duodeni. 149.

CAVE, A J E The mammalian temporo pterygoid ligament.
Journal of Zoology, 188(4), 1979. 517-532.
LIGAMENTS; MUSCULATURE.
An account is given of a generally unrecognized fascial ligament (lig. ligamentum temporo-pterygoideum) found in Gorilla gorilla berengei, Pan satyrus, Pongo pygmaeus, Diceros bicornis, Ceratotherium simium, Delphinus delphis and in other eutherian mammals. This structure is a functional specialization of the salpingo-palatal fascia, developed in response to the activity of the palatal tensor and levator musculature. The ligament is attached superiorly to the Eustachian process of the temporal bone and inferiorly to the hamular process of the medial pterygoid lamina. It is responsible for the development of both these processes, which, in the macerated cranium, testify to the original presence of this ligament. 264.

CAVE, A J E The pattern of aortic arch branching in the rhinocerotidae.
Journal of Zoology, 213(2), 1987. 253-262.
AORTIC ARCH.
The little-known pattern of aortic arch branching in the Rhinocerotidae has been determined in 10 individual rhinoceroses representing four of the five extant rhinoceros species Rhinoceros unicornis, R. sondaicus, Didermocerus sumatrensis, Diceros bicornis, Ceratotherium simum. Present observations augment recorded information concerning this pattern of branching in the Asian rhinoceros forms and permit its first-time description in the African forms. They tentatively indicate the canonical pattern of aortic arch branching in certain rhinoceros species, and demonstrate the taxonomic insignificance of such branching. 159.

*CAVE, A J E The processus glandis in the Rhinocerotidae.
Proceedings of the Zoological Society of London, 143(4), 1964. 569-586.
ANATOMY.

*CAVE, A J E The rhinoceros faucial and laryngopharyngeal tonsils.
Journal of Zoology, 187(4), 1979. 471-503.
TONSILS; ANATOMY.

CAVE, A J E The rhinoceros lingual intrinsic musculature.
Mammalia, 44(1), 1980. 123-128.
TONGUE; MUSCULATURE; MORPHOLOGY.
A description is given of the anatomical relationship, found by dissection, between the intrinsic and extrinsic muscles of the rhinoceros (Rhinoceros, Ceratotherium, Diceros) tongue. This relationship, one of continuity, proclaims the intrinsic muscles to be extensions of the extrinsic muscles and not independent morphological entities. In this respect, the rhinoceros tongue resembles the horse tongue. 271.

CAVE, A J E The thyroid and parathyroid glands in the Rhinocerotidae.
Journal of Zoology, 178(4), 1976. 413-442; 25 ref.
PARATHYROID GLAND; THYROID GLAND.

*DAVIES, J The anatomy of a twenty-two millimetre embryo of the African rhinoceros (Rhinoceros bicornis).
Proceedings of the Zoological Society of London, 122, 1953. 593-613.
EMBRYO; MORPHOLOGY.

*GODDARD, J A note on the absence of pinnae in the black rhinoceros.
East African Wildlife Journal, 7, 1969. 178-180.
ANATOMY.

GODFREY, R W POPE, C E DRESSER, B L OLSEN, J H Gross anatomy of the reproductive tract of female black Diceros bicornis michaeli and white rhinoceros Ceratotherium simum simum.
Zoo Biology, 10(2), 1991. 165-176.
REPRODUCTIVE TRACT; EMBRYO TRANSFER; FERTILITY; ARTIFICIAL INSEMINATION; BREEDING.
Reproductive tracts were collected from three black rhinoceros and two white rhinoceros at necropsy. All females were nulliparous, except for one primiparous white rhinoceros. The animals ranged in age from 7 days to 28 years. All nulliparous animals had a constriction in the vaginal canal, which appeared to be a hymen. The primiparous female had only remnants of a hymen. The total length of the tract averaged 102 cm in three adult animals (.gtoreq. 21 years old). The distance from the vulva to the external cervical os averaged 40 cm in these animals. The endometrium of a 28-year-old nulliparous black rhinoceros and a 27-year-old nulliparous white rhinoceros exhibited signs of hyperplasia, whereas this condition was not present in the other animals. It is not known if this condition was related to the fertility of these animals. The cervix of the rhinoceros was firm, and the lumen followed a very tortuous path through eccentric rings of tissue. Visual examination of the ovaries revealed the presence of surface follicles on the ovaries in both species. The overall size of the reproductive tract, especially the vagina and uterine horns, and the extremely tortuous cervical lumen will present obstacles that must be overcome when developing artificial insemination and embryo transfer procedures for use in rhinoceros. 59.

HAARMANN, K Morphologica and histological investigations on the neo cortex of several Perissodactyla.
Acta Anatomica, 90(2), 1974. 285-299.
MORPHOLOGY; HISTOLOGY; NEO CORTEX; EVOLUTION.

#KJAERSGAARD, P A note on m. articularis humeri in the wild boar, bear, tapir and rhinoceros.
Gegenbaurs morphologisches Jahrbuch, 120, 1974. 143-145.
MUSCLES; ANATOMY.

KRUSKA, D Cerebralization evolution of the brain and changes in brain size as a cause of domestication within the order Perissodactyla and a comparison with the order Artiodactyla.
Zeitschrift fur zoologische Systematik und Evolutionsforschung, 11(2), 1973. 81-103.
BRAIN; EVOLUTION.

KYOU JOUFFROY, F The musculature of the pelvic limb in the daman dendrohyrax dorsalis comparison with the other tridacryl mesaxonians the tapir and the rhinoceros.
Biologia Gabonica, 7(3), 1971. 271-288.
LEGS.

*MEINERTZHAGEN, R Some weights and measurements of large mammals.
Proceedings of the Zoological Society of London, A, 1938. 433-439.
WEIGHT; PHYSIOLOGY; GROWTH.

MILLER, R E MCCLURE, R C CONSTANTINESCU, G M BOEVER, W J A clinical note on the vascular anatomy of the black rhinoceros (Diceros bicornis) forelimb.
Journal of Zoo and Wildlife Medicine, 20(2), 1989. 228-230, illus.
VEINS.

PETERSON, J A BENSON, J A MORIN, J G MCFALL NGAI, M J Scaling in tensile skeletons scale dependent length of the achilles tendon in mammals.
Journal of Zoology, 202(3), 1984. 361-372.
ACHILLES TENDON; TENDONS; ANATOMY.
The Achilles tendon of a diverse group of mammals Sanguinius mystax (marmoset), Galago senegalensis, bushbaby), Lagothrix sp. wooly monkey), Cercopithecus aethiops (vervet monkey), Colobus polykomos (colobus monkey), Pongo pygmaeus (orang-utan; juvenile), Mus musculus (house mouse), Peromyscus sp. (field mouse), Rattus norvegicus (rat), Dipodomys merriami (kangaroo rat) Oryctolagus cuniculus (rabbit), Felis catus (domestic cat), Canis familiaris (domestic dog), Acinonyx jubatus (cheetah), Panthera leo (Lion; juvenile), Ovis aries (sheep), Alcelaphus buselaphus caama (cape hartebeest), Tragelaphus strepsiceros (kudu), Giraffa camelopardalis (giraffe), Diceros bicornis (black rhino) ranging from the mouse (12 g) to the rhinoceros (1300 kg) scales so that the tendon length varies as tendon diameter, 0.931. +-. 0.069($r = 0.983$). Tendon length scales as (body mass)0.342. +-. 0.028, and tendon diameter scales as (body mass)0.361. +-. 0.029. If tendon stress and strain are scale independent, the capacity of the tendon to store elastic stain energy remains proportion to body mass. If tendon stress and strain increase with body mass, energy storage may scale somewhat higher. The scaling of the Achilles tendon is consistent with its role in storing strain energy and different from that of a variety of other tensile skeletal elements which exhibit scale independent length dimensions. 205.

#SCHAFFER, N E BEEHLER, B A Preliminary studies on the anatomy and ultrasonic images of the reproductive structures of three species of rhinoceroses (Rhinoceros unicornis, Diceros bicornis, Ceratotherium simum).
Proceedings of the American Association of Zoo Veterinarians, 1990, 1990. 215-220.
ANATOMY; REPRODUCTIVE SYSTEM.

*SCHAUMBURG, S Comparative studies of the black and the white rhinoceros.
African Wildlife, 7(2), 1953. 124-127.
ANATOMY; BEHAVIOUR.

SHADWICK, R E RUSSELL, A P LAUFF, R F Structure and mechanical design of white rhinoceros dermal armor. IN: Annual Meeting of the American Society of Zoologists, American Microscopical Society, Animal Behavior Society, the Crustacean Society and the International Association of Astacology, Atlanta, Georgia, USA, December 27-30, 1991.
American Zoologist, 31(5), 1991. 54A.
INTEGUMENT; SKIN.

SHADWICK, R E RUSSELL, A P LAUFF, R F The structure and mechanical design of rhinoceros dermal armour.
Philosophical Transactions of the Royal Society of London B Biological Sciences, 337(1282), 1992. 419-428.
INTEGUMENT; SKIN.
The collagenous dermis of the white rhinoceros forms a thick, protective armour that is highly specialized in its structure and material properties compared with other mammalian skin. Rhinoceros skin is three times thicker than predicted allometrically, and it contains a dense and highly ordered three-dimensional array of relatively straight and highly crosslinked collagen fibres. The skin of the back and flanks exhibits a steep stress-strain curve with very little 'toe' region, a high elastic modulus (240 MPa), a high tensile strength (30 MPa), a low breaking strain (0.24) and high breaking energy (3 MJm-3) and work of fracture (78 kJm-2). By comparison, the belly skin is somewhat less stiff, weaker, and more extensible. In compression, rhinoceros skin withstands average stresses and strains of 170 MPa and 0.7, respectively, before yielding. As a biological material, rhinoceros dorsolateral skin has properties that are intermediate between those of 'normal' mammalian skin and tendons. This study shows that the dermal armour of the rhinoceros is very well adapted to resist blows from the horns of conspecifics, as might occur during aggressive behaviour, due to specialized material properties as well as its great thickness. 18.

THENIUS, E On the problem of airorhynchie of the mammalian skull; an interpretation.
Zoologischer Anzeiger, 185(3-4), 1970. 159-172.
SKULL.

VAN DEN BERGH, H K A note on eyelashes in an African black rhinoceros Diceros bicornis.
Journal of Zoology, 161(2), 1970. 191.
EYELASHES.

*WILSON, V J *EDWARDS, P W Data from a female rhinoceros and foetus (Diceros bicornis Linn.) from the Fort Jameson district.
The Puku, 3, 1965. 179-180.
AGE; TEETH; ANATOMY; MORPHOLOGY.

BACTERIAL DISEASES

AMTSBERG, G Occurrence of Staphylococcus hyicus in pigs and of Staphylococcus epidermidis biotype 2 in other animals. OT: Untersuchungen zum Vorkommen von Staphylococcus hyicus beim Schwein bzw. von Staphylococcus epidermidis Biotyp 2 bei anderen Tierarten.
Deutsche Tierarztliche Wochenschrift, 85(10), 1978. 385-389; 23 ref.
STAPHYLOCOCCUS; SKIN DISEASES; DERMATITIS.
Material studied included organs and skins, from swine and other animals, received at Hanover for bacteriological diagnosis, together with swabs from the skin, nose, vagina and cervix of swine, swabs from the skin of cattle, and samples of urine and milk from sows. Of the 196 porcine S. hyicus isolates, 73 were from swine with exudative eczema and 20 from clinically healthy swine. Of the 55 bovine isolates of S. epidermidis biotype 2, only two were from cattle with clinically healthy skin, most deriving from those with scab, parakeratosis and eczema; one each was obtained from a horse, dog, nutria, rhinoceros, elephant and monkey.. German Federal Republic. German.

#ASAKURA, S NAKAGAWA, S MASUI, M On the leptospirosis of the black rhinoceros.
Journal of the Japanese Association of Zoological Gardens and Aquariums, 2, 1960. 35-37.
LEPTOSPIROSIS.

CLAUSEN, B ASHFORD, W A Bacteriologic survey of black rhinoceros Diceros bicornis.
Journal of Wildlife Diseases, 16(4), 1980. 475-480.
STREPTOCOCCUS; STAPHYLOCOCCUS; SKIN DISEASES; SALMONELLA; SEPTICEMIA; STREPTOMYCIN; PENICILLINS; DRUGS.
A bacteriological survey was carried out on 30 black rhinoceros (Diceros bicornis) of which 23 were newly captured and 7 were captive. A .beta. -hemolytic Streptococcus, group L was found in skin lesions and various wounds, causing septicemia and death in 2 animals. Staphylococcus aureus was found in 3 rhinoceros, and caused the death of one. The bacteria isolated often proved resistant to penicillin. Streptomycin is recommended for treatment. Sixteen other bacteria sp. were isolated, and apart from a Salmonella sp. none were considered to be specific pathogens. 256.

DE VOS, V Black rhino Diceros bicornis minor mortality in the Kruger National Park South Africa.
Koedoe, (23), 1980. 188-189.
MORTALITY; BOTULISM; KRUGER NATIONAL PARK.

#GRIFFITH, A S Tuberculosis in captive wild animals.
Journal of Hygiene, 28, 1928. 198-218.
TUBERCULOSIS; ZOOS.

HUNTER, P FLAMAND, J R B MYBURGH, J VAN DER MERWE, S M Serological reactions to Leptospira species in game animals of northern Natal.
Onderstepoort Journal of Veterinary Research, 5(3), 1988. 191-192, illus.
LEPTOSPIRA.

JESSUP, D A MILLER, R E BOLIN, C A KOCK, M D MORKEL, P Retrospective evaluation of Leptospirosis in free-ranging and captive black rhinoceroses (Diceros bicornis) by microscopic agglutination titers and fluorescent antibody testing.
Journal of Zoo and Wildlife Medicine, 23 (4), 1992. 401-408.
LEPTOSPIROSIS.

KEEP, M E BASSON, P A Mycobacteriosis in a black rhinoceros Diceros bicornis.
Journal of the South African Veterinary Association, 44(3), 1973. 285-286.
MYCOBACTERIOSIS.

KOCK, N D JONGEJAN, F KOCK, M D KOCK, R A MORKEL, P Serological evidence for Cowdria ruminantium infection in free-ranging black (Diceros bicornis) and white (Ceratotherium simum) rhinoceroses in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 23 (4), 1992. 409-413.
COWDRIA RUMINANTIUM.

KRIEK, N P J A stress-related disease of white rhinos caused by commensal bacteria.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 186-187 Pretoria: South African Veterinary Association Wildlife Group, University of Pretoria.
BACTERIAL DISEASES; STRESS.

MANN, P C BUSH, M JANSSEN, D L FRANK, E S MONTALI, R J Clinicopathologic correlations of tuberculosis in large zoo mammals.
Journal of the American Veterinary Medical Association, 179(11), 1981. 1123-1129; 17 ref.
TUBERCULOSIS.
In August 1978, a black rhinoceros at the National Zoological Park died with generalized tuberculosis caused by Mycobacterium bovis. A second black rhinoceros was killed 9 months after M. bovis was cultured from its lungs. After these two deaths, numerous large zoo mammals that had been potentially exposed were subjected to various procedures to ascertain their status regarding tuberculosis. The procedures were: intradermal tuberculin testing, evaluation of delayed hypersensitivity reaction on biopsy specimens, enzyme-linked immunosorbent assay (ELISA) testing, and culture of various secretions and organs. Several of the animals in this series died during the study and were examined for evidence of mycobacterial infection. The results of tuberculin testing varied from species to species and from site to site within a species. Delayed hypersensitivity responses generally correlated well with the amount of swelling at the tuberculin site. In some cases, however, positive reactions were found without any delayed hypersensitivity response. Results of ELISA testing were confirmatory in tuberculous animals. Several species were judged to be nonspecific reactors, based on positive or suspect tuberculin test results, with negative ELISA results and PM findings..

MANZ, J GRUBER, S STEGER, G Determination of O-serotypes in animals (Camelidae, elephant, rhinoceros, Equidae) in the Nuremberg Zoo. (Bestimmung serologischer O-Gruppen von Escherichia coli aus Bestanden des Tiergartens Nurnberg). IN: IPPEN, R and SCHRODER, H D (Ed). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 14-18 Juni 1978, Dvur Kralove, 20, 1978. 31-35; 21 ref. Berlin, German Democratic Republic: Akademie Verlag.
ESCHERICHIA.
German Federal Republic. German Summaries in English, French, Russian.

MBISE, A N NYANGE, J F C MBASHA, E M S An outbreak of anthrax in wildlife in Lake Manyara National Park, Tanzania.
Proceedings of the Tanzania Veterinary Association Scientific Conference, 2, 1984. 126-139; 18 ref.
ANTHRAX; TANZANIA; LAKE MANYARA NATIONAL PARK.
Between January and April 1984 more than 700 impalas (over 45% of the estimated total population), 2 elephants, 3 hippopotamus and 4 rhinoceros in the National Park were thought to have died of anthrax. Bacillus anthracis was identified in blood smears from a rhinoceros and several impalas. Another 18 animals and birds were found dead during the investigation but the causes of their deaths were not determined.,

#MIKULICA, V Zur Leptospirose der Exotichentiere in den zoologischen Garten.(Leptospirosis in exotic animals in a zoological garden).
Vychodocska Zoologicka Zahrada, 41, 1986. 571-576.
ZOOS; LEPTOSPIROSIS.

MILLER, R E BOLIN, C A Evaluation of leptospirosis in black rhinoceroses (Diceros bicornis) by microscopic agglutination and fluorescent antibody testing.
Proceedings of the American Association of Zoo Veterinarians, 1989. 161-162.
LEPTOSPIROSIS.

MORIMOTO, T MIYASHITA, M NAGASE, K SAKAKIHARA, Y NAKAGAWA, T A case report of systemic staphylococcal pustulosis in a black rhinoceros Diceros bicornis.
Journal of Japanese Association of Zoological Gardens and Aquariums, 29(3), 1987. 55-59, illus.
STAPHYLOCOCCUS.
Skin infection and treatment, a case report. Japanese Summary in English.

PAGE, C D SCHMIDT, R E Disseminated intravascular coagulation in a neonatal white rhinoceros (Ceratotherium simum simum).
Journal of Zoo Animal Medicine, 18(2/3), 1987. 53-55; 1 ref.
SALMONELLOSIS; BLOOD.

#POWERS, R R PRICE, R A Human tuberculosis in a rhinoceros.
Journal of the American Veterinary Medical Association, 151, 1967. 891-892.
TUBERCULOSIS.

SCHALLER, K "Salmonella lameness" in Rhinoceros calf (Ceratotherium s. simum). (Uber einen Fall von "Salmonellenlahme" bei einem Nashornkalb (Ceratotherium s. simum). IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 24-28 Juni, 1981, Halle/Saale, 23, 1981. 89-94; 13 ref. Berlin, German Democratic Republic: Akademie Verlag.
SALMONELLOSIS.
German Summaries in English, French, Russian.

#SCHENKEL, R L SCHENKEL-HULLIGER, L Diseases (Leptospirosis), IN:. Ecology and behavior of the black rhinoceros, 1969. 26. Hamburg: Paul Parey.
LEPTOSPIROSIS.

#SCHMIDT, M E HARTFIELD, D A Disseminated bacterial infection in an infant rhinoceros.
Journal of Zoo Animal Medicine, 7, 1976. 15-17.
CALF.

#TAKAGI, S KONDO, M NODA, S HIRONAO, T Tuberculosis in a rhinoceros.
Bulletin of the University of Osaka Prefaure, 15, 1964. 125-130.
TUBERCULOSIS.

THOEN, C O MILLS, K HOPKINS, M P Enzyme linked protein A an enzyme linked immuno sorbent assay reagent for detecting antibodies in tuberculous exotic animals.
American Journal of Veterinary Research, 41(5), 1980. 833-835.
TUBERCULOSIS; MYCOBACTERIUM.

WINDSOR, R S ASHFORD, W A Salmonella infection in the African elephant and the black rhinoceros.
Tropical Animal Health and Production, 4(4), 1972. 214-219.
SALMONELLOSIS.

BEHAVIOUR

ADCOCK, K The relevance of 'territorial' behavior in black rhino to their population management.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 82-86 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT; TERRITORIALITY.

ANON Meeting of rhinos of two species.
Lammergeyer, 1, 1960. 40-41.
BEHAVIOUR.

ANON (Territoriality in the white rhino).
ZIVA, 25(1), 1977. 28.
BEHAVIOUR; TERRITORIALITY.
CZECH.

BERGER, J Disassociation between black rhinoceros mothers and young calves; ecologically variable or, as yet, undetected behaviour?.
African Journal of Ecology, 31, 1993. 261-264.
BEHAVIOUR.

*BOURGOIN, P Animaux de chasse d'Afrique.
1955. 255. Paris: Toison D'or.
BEHAVIOUR.

*BROOKS, A C The white rhinoceros in West Nile.
1959. Unpublished manuscript. Uganda Game Department.
WEST NILE; BEHAVIOUR.

*CAMPBELL, G. Rhino on two legs (Erect stance in browsing).
Field, 1957. 570.
ECOLOGY; BEHAVIOUR.

*CHILD, G Behaviour of large mammals during the formation of Lake Kariba.
1968. 123 Salisbury: Trustees of the National Museums of Rhodesia (Kariba studies).
ECOLOGY; IMMOBILISATION/DRUGS; LAKE KARIBA.

*CONDY, P R The population status social behaviour and daily activity pattern of the white rhino (Ceratotherium simum simum) in the Kyle National Park Rhodesia.
1973. M Sc Thesis. University of Rhodesia.
POPULATIONS; STATUS; BEHAVIOUR; KYLE NATIONAL PARK.

*DE ST. CROIX, O H The white rhinos of Hluhluwe.
Journal of the Bombay Natural History Society, 58, 1962. 231-233.
HLUHLUWE GAME RESERVE; BEHAVIOUR.

DU PREEZ, J S GROBLER, I D Drinking times and behaviour at waterholes of some game species in the Etosha National Park.
Madoqua, 10, 1977. 61-69.
ETOSHA NATIONAL PARK.

EEKHOUT, M Tragedy in the wild.
Natal Wildlife, 30(12), 1989. 9, illustr.
MORTALITY; FIGHTING.

ESTES, R D The significance of breeding synchrony in the wildebeest.
East African Wildlife Journal, 14(2), 1976. 135-152.
BREEDING; CALF; PREDATORS.
Unlike most ungulates, whose offspring remain concealed for some time after birth, the offspring of the wildebeest Connochaetes taurinus and other alcelaphine antelopes (except hartebeest) accompany the mother from the very 1st h. Most other ungulates that have follower-young either protect them effectively through a maternal or group defense (e.g., cattle, muskox, equids and rhinoceroses), or are able to flee to sanctuaries (e.g., goats, sheep and goat-antelopes)..

*FEELY, J M Square-lipped rhinoceros Ceratotherium simum.
Lammergeyer, 2(2), 1962. 48-49.
BEHAVIOUR.

*FRAME, G W GODDARD, J Black rhinoceros vocalisations.
East African Wildlife Journal, 8, 1970. 207.
BEHAVIOUR.

*FRAME, G W The black rhinoceros.
Animals, 13(15), 1971. 692-699.
BEHAVIOUR; ECOLOGY.

*GODDARD, J Home range, behaviour, and recruitment rates of two black rhinoceros populations.
East African Wildlife Journal, 5, 1967. 133-150.
BEHAVIOUR; ECOLOGY.

*GODDARD, J Mating and courtship of the black rhinoceros (Diceros bicornis L.).
East African Wildlife Journal, 4, 1966. 69-75.
MATING; MORPHOLOGY; ECOLOGY.

HALL-MARTIN, A J PENZHORN, B L Behavior and recruitment of translocated black rhinoceros Diceros bicornis.
Koedoe, (20), 1977. 147-162.
TRANSLOCATION; STRESS; AGGRESSION; MATING; SWIMMING.
Black rhinoceros were translocated to the Addo Elephant National Park from Kenya Africa and released into a small fenced enclosure. Serious fighting attributed to the conditions under which the animals were released, the unusually high population density, the meeting of strange animals, aggression associated with mating and individual temperament resulted in the deaths of 3 animals within 3 wk. Later fighting between bulls accounted for 2 more deaths. A peak in mating activity was recorded during spring to mid-summer, followed by a peak calving period in late summer. The calving interval (35 mo.) is longer than that of unrestricted populations but ages at 1st mating in cows (4 yr 6 mo., 4 yr 7 mo.) are comparable. First parturition at Addo occurs later (8 yr, 8 yr 5 mo.) than in wild animals and the young are hidden for the 1st few days after birth. Under conditions of stress a subadult bull readily took to swimming as a means of escaping from other animals. 279.

*HALL-MARTIN, A J Recruitment in a small black rhino population.
Pachyderm, 7, 1986. 6-8.
BEHAVIOUR.

*HEATH, M M Rhino - elephant association.
East Africa Natural History Society, Bulletin, April, 1973. 54.
BEHAVIOUR; ELEPHANT; ECOLOGY.

*HEPPES, J B The white rhino.
Uganda Wildlife and Sport, 1(4), 1958. 29-35.
BEHAVIOUR.

HODGDEN, R Short-term separation and stress of mother and daughter southern white rhinoceroses at the North Carolina Zoological Park USA. IN: Conference on Ungulate Behavior and Management, College Station, Texas, USA, May 23-27, 1988.
Applied Animal Behaviour Science, 29(1-4), 1991. 513.
ZOOS; UNITED STATES; STRESS.

JARMAN, P J The use of drinking sites, wallows and salt licks by herbivores in the flooded Middle Zambezi Valley.
East African Wildlife Journal, 10, 1972. 193-209.
ZAMBEZI VALLEY; BEHAVIOUR.

*KINGDON, J East African mammals: an atlas of evolution in Africa, III part B: Large mammals: iv.
1979. 436pp. London: Academic Press.
ANATOMY; EVOLUTION.

KIWIA, H Y D Diurnal activity pattern of the black rhinoceros Diceros bicornis in Ngorongoro Crater Tanzania.
African Journal of Ecology, 24(2), 1986. 89-96.
NGORONGORO CRATER; DESCRIPTION.
The diurnal activity of the black rhinoceros was studied in Ngorongoro Crater, Tanzania, from December 1980 to May 1982. From fourteen individuals of different sex and age classes, data were collected for a total of 656 and 473 observation hours in wet and dry seasons respectively. The rhinoceros were most active in early morning and late afternoon, and inactive at midday. In both seasons, the rhinoceros spent almost half of the day time lying down. Walking and feeding comprised the other major activities. Results from this study were similar to those of Goddard (1967) attained between 1967 and 1966, from the same population (which was then four times larger) and from the rhinoceros of Olduvai Gorge. Nocturnal studies were not feasible, because the rhinoceros retreated into the Crater forests at night where they presumably spent much of the time feeding since they fed little during the day time. 186.

KIWIA, H Y D Ranging patterns of the black rhinoceros Diceros bicornis L. in the Ngorongoro Crater Tanzania.
African Journal of Ecology, 27(4), 1989. 305-312.
NGORONGORO CRATER; BEHAVIOUR; POPULATIONS; HABITAT.
Annual and seasonal ranges of nine known resident black rhinoceros (Diceros bicornis (L.)) consisting of one adult male, six adult females and two sub-adults, in Ngorongoro Crater, Tanzania were determined from observations made from January, 1981 to May, 1982. Range sizes were influenced by density and quality of the habitat. The adult male had the largest annual range of 69. 0 km2, the six adult females' ranges were between 12.5 and 47.3 km2, the sub-adult male's range was 22.8 km2 and the sub-adult female's 25.0 km2. Seasonal ranges of all resident individuals overlapped extensively. The annual range of the male overlapped slightly with those of other males at the Crater wall. The annual ranges of the resident male and females overlapped extensively. Individuals of all sex and age classes defaecated more on preformed dung piles. The densities of dung piles in sample areas of Lerai forest and open grassland were 78.5 and 9.3 km-2, respectively, and most of these piles were deposited within a metre of the main rhino tracks. Rhinos of all sex and age classes scraped dung piles and all sub-adult males and bulls spray-urinated. 116.

*KLINGEL, H KLINGEL, U The rhinoceroses of Ngorongoro crater.
Oryx, 8 (5), 1966. 302-306.
NGORONGORO CRATER.

*LANG, H Recent and historical notes on the square-lipped rhinoceros.
Journal of Mammalogy, 4(3), 1923. 155-163.
BEHAVIOUR.

*LEUTHOLD, W African ungulates; a comparative review of their ethology and behavioural ecology.
Zoophysiology and Ecology, 8, 1977. 307pp. Berlin: Springer.
ECOLOGY.

MIKULICA, V Social behaviour in two captive groups of white rhinoceros (Ceratotherium simum simum and Ceratotherium simum cottoni).
Zoologische Garten, 61(5-6), 1991. 365-385, illus.
ZOOS.

MIKULICA, V Sozialverhalten der Breitmaulnashorner (Ceratotherium simum) in der Gefangenschaft.
Wissenschaftliche Zeitschrift der Humboldt Universitat zu Berlin
Mathematisch naturwissenschaftliche Reihe, 35(3), 1986. 296-300, illus.
ZOOS.
German.

*MOEHLMAN, P D The odd-toed ungulates; order Perissodactyla. IN: BROWN, R E and MACDONALD, D W (Eds). Social odours of mammals. Vol. 2.
1985. 536-537. Oxford: Clarendon Press.
ODOUR.

OWEN SMITH, N Dominance territoriality and social organization in the white rhinoceros.
American Zoologist, 12(4), 1972. 644.
TERRITORIALITY.

#OWEN-SMITH, N Territoriality in the white rhinoceros (Ceratotherium simum simum).
Nature, 231, 1971. 294.
TERRITORIALITY.

OWEN SMITH, N Territoriality the example of the white rhinoceros.
Zoologica Africana, 7(1), 1972. 273-280.
TERRITORIALITY.

*OWEN-SMITH, R N The behavioural ecology of the white rhinoceros.
1973. 786pp. Thesis. Wisconsin: University of Wisconsin.
ECOLOGY; THESES.

OWEN SMITH, R N The social ethology of the white rhinoceros Ceratotherium simum.
Zeitschrift fur Tierpsychologie (Journal of Comparative Ethology), 38(4), 1975. 337-384.
TERRITORIALITY; ECOLOGY; ETHOLOGY; NUTRITION; REPRODUCTION.

PIENAAR, D J Habitat preference of the white rhino in the Kruger National Park.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 59-64 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
ECOLOGY; HABITAT.

PIENAAR, D J Social organisation and behaviour of the white rhinoceros.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 87-92 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
BEHAVIOUR.

PIENAAR, D J BOTHMA, J D THERON, G K White rhinoceros range size in the south-western Kruger National Park.
Journal of Zoology, 229(4), 1993. 641-649.
KRUGER NATIONAL PARK; POPULATIONS; TERRITORIALITY.
White rhinoceros range size was ascertained telemetrically in the south-western Kruger National Park. The mean annual range size of territorial males was 9.86 km2 compared to 22.83 km2 for adult females. White rhinoceros females' summer wet season range was larger (21.44 km2) than the winter dry season range (11.64 km2). It is argued that abundant field-water during the wet season enables animals to range further from permanent water supplies and to utilize larger foraging areas. White rhinoceros have core areas in their individual ranges that usually are situated along riverbanks in the preferred grazing regions. These core areas also include some favourite resting spots on high-lying areas. White rhinoceros range sizes in the south-western Kruger National Park were similar to those of other reserves with comparable white rhinoceros densities. In the Umfolozi Game Reserve, which has a higher white rhinoceros density than the Kruger National Park, the individual ranges are much smaller. 11.

*PITMAN, C R S Weapons of the two African rhinoceroses.
Oryx, 3 (4), 1956. 195-196.
BEHAVIOUR.

*PLAYER, I The white rhino saga.
1972. 254pp. London: Collins.
BOOKS; CAPTURE.

POPP, J W BUNKFELDT-POPP, L Interspecific aggression among female ungulates.
Aggressive Behavior, 12(3), 1986. 197-200.
AGGRESSION.
Interspecific aggression among captive female ungulates was investigated. Asymmetries in fighting abilities proved to be good predictors of relative levels of aggression between different pairs of species. The resource under dispute also influenced the nature of aggressive encounters. The results of this study were discussed in the light of game theory. 190.

*RICHARDS,D Square-lipped rhinoceros behaviour.
Lammergeyer, 15, 1972. 77-78.
BEHAVIOUR.

*ROTH, H H *CHILD, G Distribution and population structure of black rhinoceros (Diceros bicornis) in the Lake Kariba basin.
Zeitschrift fur Saugetierkunde, 33, 1968. 214-226.
BEHAVIOUR; DISTRIBUTION; LAKE KARIBA.

ROTH, H H On the swimming of African terrestrial mammals in the Kariba reservoir area and their behavior toward the flood waters.
Zoologische Garten, 37(1-3), 1969. 12-29.
LAKE KARIBA; SWIMMING.

*SCHENKEL, R *LANG, E M Das Verhalten der Nashorner.
Handbuch der Zoologie, 8(46), 1969. 1-56.
BEHAVIOUR.

*SCHENKEL, R *SCHENKEL-HULLIGER, L Ecology and behaviour of the black rhinoceros (Diceros bicornis L): a field study.
1969. 101. Hamburg and Berlin: Paul Parey.
ECOLOGY; MORPHOLOGY; BOOKS.

*SCHENKEL, R Zum Problem der Territorialitat und des Markierens bei Saugern - am Beispiel des schwarzen Nashorns und des Lowens.
Zeitschrift fur Tierpsychologie (Journal of Comparative Ethology), 23(5), 1966. 593-626.
TERRITORIALITY; DISTRIBUTION.

*SCHOMBER, H W Wild life in the Sudan, Part 3. White and black rhinoceros and giant eland.
African Wildlife, 17(1), 1963. 29-35.
BEHAVIOUR; SUDAN.

*SKEAD, C J Puzzle of rubbing stones.
African Wildlife. 25(1), 1971. 36-37.
BEHAVIOUR.

*SPINAGE, C A Aus dem Leben des Spitzmaulnashorns.
Kosmos, 58, 1962. 77-79.
BEHAVIOUR.

*SPINAGE, C A Some notes on the rhinoceros.
African Wildlife, 14(2), 1960. 95-100.
BEHAVIOUR.

*STEVENSON-HAMILTON, J Wild life in South Africa.
1950. 364. London: Cassel.
BEHAVIOUR; SOUTH AFRICA.

*STOCKLEY, C H The hook-lipped rhinoceros.
Zoo life, 5(3), 1950. 88-91.
BEHAVIOUR.

*SWANEPOEL, P D My first encounter with a black rhino.
African Wildlife, 9(3), 1955. 209-210.
BEHAVIOUR.

*TABERNER, W H M Amboseli - unique and wonderful game reserve full of animal personalities.
Wild Life, 1(4), 1969. 16-19.
BEHAVIOUR; AMBOSELI.

*ULMER, F The living rhinoceroses.
Fauna, 3, 1941. 3-10.
BEHAVIOUR.

UNDERWOOD, R Surveying ungulate groups.
African Journal of Ecology, 20(2), 1982. 105-112.
ZIMBABWE; POPULATIONS; ECOLOGY.
The size and structure of groups of 7 spp. of ungulates (Connochaetes taurinus taurinus, Aepyceros melampus arudinum, Equus burchelli antiguorum, Tragelaphus strepsiceros, Ceratotherium simum simum, Damaliscus lunatus lunatus) were recorded over a 2-yr period. The size of the group did not significantly correlate with its distance from the observer when first sighted. Large groups were more likely than small ones to be grazing or lying when first seen. For impala and zebra, grazing groups tended to be further from the observer than lying or moving ones. Terrain screening is suggested as the main factor affecting sighting distance at Kyle Recreational Park, Zimbabwe. 232.

*VAN BRUGGEN, A C Witte neushoorns.
Artis, 11(3), 1965. 76-81.
BEHAVIOUR.

*VAN DEN BERGH, W Encore une fois: les rhinoceros blancs.
Zoologische Garten, 24(3/4), 1958. 285.
BEHAVIOUR.

*VAN DEN BERGH, W Nos rhinoceros blancs (Ceratotherium simum cottoni Lydekker).
Zoologische Garten, 21(3), 1955. 129-151.
BEHAVIOUR.

*VAN DEN BERGH, W Nos rhinoceros blancs, Ceratothetium simum cottoni Lydekker.
Zoo, 18, 1952. 6-26.
BEHAVIOUR.

*VAUGHAN-KIRBY, F The white rhinoceros with a special reference to its habit in Zululand.
Annals of the Durban Musuem, 2, 1920. 223-242.
BEHAVIOUR; ZULULAND.

VON MUGGENTHALER, E K STOUGHTON, J W DANIEL, J C Infrasound from the Rhinocerotidae. IN: RYDER, O A (Ed). Rhinoceros biology and conservation Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA.
1993. 136-140. illus. San Diego: Zoological Society of San Diego.
INFRASOUND; BEHAVIOUR; COMMUNICATION; ACOUSTIC SIGNALS.

*WALKER, E S The irascible rhino: a testy neighbour with unsociable habits. Field, 238, 1971. 766.
BEHAVIOUR.

WALTHER, F R Communication and expression in hoofed mammals. 1984. 3-101, 246-247, 263-265,313-322, 329-336. Bloomington: Indiana University Press.
BEHAVIOUR.

*WESTERN, D An aerial method of monitoring large mammals and their environment with a description of a computer program for survey analysis. Project Working Document, 9, 1976. UNDP/FAO Kenya Wildlife Management Project.
CENSUSING; ECOLOGY; HABITAT.

*WILHELM, J H Das Wild des Okawangogebietes und des Caprivizipfels. Journal of the South West African Scientific Society, 7, 1950. 1-71.
BEHAVIOUR; OKAVANGO; CAPRIVI.

*WILHELM, J H Das Wild des Okawangogebietes und des Caprivizipfels. Journal of the South West African Scientific Society, 6, 1933. 51-74.
BEHAVIOUR; OKAVANGO; CAPRIVI.

YOUNG, E The big five; the black rhinoceros Diceros bicornis. Natura, 5, 1985. 28-29.
DESCRIPTION.

BIBLIOGRAPHIES

MILLER, R E Veterinary bibliography for rhinoceroses. 1992. 55pp. St Louis: Saint Louis Zoo.
BIBLIOGRAPHIES.

ROOKMAAKER, L C Bibliography of the rhinoceros; an analysis of the literature on the recent rhinoceroses in culture history and biology. 1983. XII+292P. ISBN 90-6191-261-X. Rotterdam: A A Balkema.
BIBLIOGRAPHIES.

WILDI, H A bibliography of black rhinoceros Diceros- bicornis Linnaeus 1758 and white rhinoceros Ceratotherium simum Burchell 1817 for Southern Africa, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988. Koedoe, 32(2), 1989. 89-123.
BIBLIOGRAPHIES.

BIOCHEMISTRY

DE JONG, W W ZWEERS, A COHEN, L H Influence of single amino-acid substitutions on electrophoretic mobility of sodium dodecyl sulfate protein complexes.
Biochemical and Biophysical Research Communications, 82(2), 1978. 532-539.
ALPHA CRYSTALLIN.
The substitutions Thr .fwdarw. Ala, Gln .fwdarw. Leu and Pro .fwdarw. Thr or Ala in mammalian .alpha.-crystallin A chains (19,830 daltons) are found to increase the electrophoretic mobility in sodium dodecyl sulfate (SDS) gel electrophoresis. Substitutions between residues of like hydrophobicity and small changes in intrinsic charge of the chain did not alter the mobility. Changes in hydrophobicity appear to influence the binding of SDS, and therefore the mobility, whereas proline may affect the conformation of the SDS-protein complex. These effects may depend on the position of the substitution in the chain. SDS gel electrophoresis is thus able to detect neutral substitutions not usually visible in regular electrophoresis. .alpha. -Crystallin from calf, whale, dog, elephant, hydrax, lemur, rabbit, guinea pig, rat, horse, pig, pika and rhinoceros was used. 298.

DE JONG, W W NUY TERWINDT, E C VERSTEEG, M Primary structures of alpha crystallin a chains of elephant whale hyrax and rhinoceros.
Biochimica et Biophysica acta, 491(2), 1977. 573-580.
PROTEIN; EDMAN DEGRADATION.
As part of a study of the evolutionary development of the eye lens protein . alpha.-crystallin the 173-residue A chain of this protein was studied in elephant Loxodonta africana, whale Balaenoptera acutorostrata, hyrax Procavia capensis and rhinoceros Ceratotherium simum. The primary structures were inferred mainly from amino acid compositions of peptides obtained by enzymic digestions and CNBr cleavage. The positions of substitutions, as compared to the known bovine A chain, were confirmed by Edman degradation. In accordance with the previously observed slow rate of evolution of the A chain only a small number of substitutions was found among these species. Elephant and hyrax share a number of unique substitutions, strongly indicating a common ancestry of these 2 spp. within the mammalian class. 314.

GASCOYNE, S C BENNETT, P M KIRKWOOD, J K HAWKEY, C M Guidelines for the interpretation of laboratory findings in birds and mammals with unknown reference ranges; plasma biochemistry.
Veterinary Record, 134 (1), 1994. 7-11.
BLOOD.
Reference ranges and clinical ranges for 11 biochemical variables in six mammalian orders including Perissodactyla.

GEORGE, M CHEMNICK, L G CISOVA, D GABRISOVA, E STRATIL, A Genetic differentiation of white rhinoceros subspecies; diagnostic differences in mitochondrial DNA and serum proteins. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 105-113, illus. San Diego: Zoological Society of San Diego.
BIOCHEMISTRY; GENETICS.

GHEBREMESKEL, K WILLIAMS, G LEWIS, J C M DU TOIT, R Serum alpha tocopherol all-trans retinol total lipids and cholesterol in the black rhinoceros Diceros bicornis.
Comparative Biochemistry and Physiology A Comparative Physiology, 91(2), 1988. 343-346.
ANAEMIA; VITAMIN A DEFICIENCY; BLOOD.
1. Mean concentration of serum alpha-tocopherol (Vitamin E) in 28 free-living black rhinoceroses sedated during translocation in Zimbabwe was 1. 92 (SD, 0.43) mg/l. 2. Alpha-tocopherol was not detectable (< 0.15 mg/l) in five captive black rhinoceroses held at London Zoo. 3. Circulating levels of all-trans retinol (Vitamin A) were not different between the two groups. 4. The low level of alpha-tocopherol in captive rhinoceroses suggests a risk of acute haemolytic anaemia. 138.

GREEN, R KEEP, M E COLMAN, N METZ, J Vitamin B 12 and its binding proteins in the serum of some wild game species.
South African Journal of Medical Sciences, 40(1), 1975. 9-14.
VITAMIN B 12; HAEMATOLOGY.

HATTINGH, J BOMZON, L MARCUS, E JOOSTE, C GANHAO, M F CHENEY, C S DE VOS, V Concentration and composition of plasma proteins in wild animals.
Comparative Biochemistry and Physiology A Comparative Physiology, 75, 1983. 441-445.
PROTEINS.

HAY, A W M WATSON, G Binding properties of serum vitamin D transport proteins in vertebrates for 24R 25 di-hydroxy cholecalciferol and 24S 25 di-hydroxy cholecalciferol in-vitro.
Comparative Biochemistry and Physiology B Comparative Biochemistry, 58(1), 1977. 43-48.
VITAMIN D.
The affinities of the specific vitamin D plasma transport proteins for 25-hydroxycholecalciferol, 24R, 25-dihydroxycholecalciferol and 24S, 25-dihydroxycholecalciferol were studied in the following species: Carassius auratus, Protopterus, Geco geco, Iguana iguana, Varanus salvator, Alligator mississippiensis, Cocatua moluccensis, Ketupa ketupa, Bubo vasseleri, Anas platyrhynchos, Branta leucopsis, Gallus gallus, Phasicinus C. colchicus, Syrmaticus soemmeringii, Grus rubicunda, Ephippioryynhus senegalensis, Tachygloss setosus, Protemnodon rufogrisea, Erinaceus europaeus, Tupaia tana, Callithix jaccus, Cebus apella, Macaca mulatta, Erythrocebus patus, Nyctalus noctula, Rattus norwegicus, Elephas maximus, Delphinos bairdii, Panthera leo, P. tigris, Cervus elphus, Lama glama, Eos grunnicus, Camelus bactrianus and Diceros simus. Fish plasma proteins bound 25-hydroxycholecalciferol, 24R, 25-dihydroxycholecalciferol and 24S, 25-dihydroxycholecalciferol with equal efficiency. Vitamin D transport proteins in birds and a monotreme bound 25-hydroxycholecalciferol more efficiently than 24R, 25-dihydroxycholecalciferol; in 1 bird the 2 seco-steroids were bound with equal efficiency. Transport proteins from marsupial and placental mammals bound 24R, 25-dihydroxycholecalciferol more efficiently than 24S, 25-dihydroxycholecalciferol. Twelve mammal transport proteins bound 25-hydroxycholecalciferol and 24R, 25-dihydroxycholecalciferol with equal efficiency, however, in 6 mammals 25-hydroxycholecalciferol was more efficiently bound. 295.

KEFFEN, R H DAUTH, J DREYER, M J VAN HEERDEN, J Blood chemical parameters in free-living white rhinoceros Ceratotherium simum.
Journal of the South African Veterinary Association, 56(4), 1985. 187-189; 7 ref.
BLOOD.

KOCK, M D MORTON, D KOCK, N PAUL, B DU TOIT, R Baseline biological data collected from chemically immobilized free-ranging black rhinoceroses (Diceros bicornis) in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 21(3), 1990. 283-291; 22 ref.
PHYSIOLOGY; HAEMATOLOGY; BLOOD.

LEAT, W M F NORTHROP, C A BUTTRESS, N JONES, D M Plasma lipids and lipoproteins of some members of the order Perissodactyla.
Comparative Biochemistry and Physiology B Comparative Biochemistry, 63(2), 1979. 275-281; 13 ref.
PLASMA LIPIDS; PROTEINS.
Blood was taken from horses, a donkey, wild horse (Equus przewalski), common zebra (Equus burchelli), mountain zebra (Equus zebra), onager (Asinus hemionus), white rhinoceros (Ceratotherium simum), black rhinoceros (Diceros bicornis), Indian rhinoceros (Rhinoceros unicornis) and Malayan tapir (Tapirus indicus). In the Equidae, high density lipoprotein was 80 to 90 and low density lipoprotein 10 to 20% of plasma lipoproteins. In the tapir high density and low density lipoproteins were present in about equal proportions. In the Rhinocerotidae, the high density lipoprotein characteristic of the Equidae and Tapiridae was absent and plasma lipoproteins consisted of a complex group with beta mobility on electrophoresis and a flotation pattern usually associated with low density lipoprotein. The fatty acid composition of plasma lipids was similar in all the animals studied, with more than 70% linoleic acid in the cholesteryl esters..

MAZUR, G BRAUNITZER, G WRIGHT, P G The primary structure of the hemo globin from a white rhinoceros Ceratotherium simum perissodactyla.
Hoppe Seyler's Zeitschrift fur Physiologische Chemie, 363(9), 1982. 1077-1086.
GENETICS; HAEMOGLOBIN.
The Hb from a white rhinoceros (C. simum) was analyzed and the complete primary structure of the .alpha. and .beta. chains is described. The globin chains were separated on CM-cellulose column in 8 M urea buffer. The amino acid sequences were mainly determined by automatic degradation of tryptic peptides in the sequenator. Globin consists of 1 .alpha.- and several .beta. -chain types. The .beta. chains differ at position .beta.62 where the amino acids threonine, serine and alanine were identified and at position .beta.116 where glutamine or lysine were found. The sequences are compared with those of horse, wild ass and zebra Hb. Five amino acid residues of horse Hb, which are involved in the .alpha.1.beta.1 contacts are substituted in white rhinoceros Hb. These substitutions are .alpha.35 Gly .fwdarw. Ser, .alpha.107 Ser .fwdarw. Val, .alpha.111 Val .fwdarw. Leu, .alpha.115 Asn .fwdarw. Gln and .beta.116 Arg .fwdarw. Gln or Lys. Furthermore glutamic acid was found at position .beta. 2 of rhinoceros Hb. In most mammalian Hb the amino acid at this position is histidine, which is one of the residues that binds, 2,3-bisphosphoglycerate in deoxyhemoglobin. In this way 2,3-bisphosphoglycerate controls the O2 affinity of Hb. 218. German.

MAZUR, G BRAUNITZER, G The primary structure of the hemoglobins from a lowland tapir Tapirus terrestris Perissodactyla glutamic-acid in position 2 of the beta chains.
Hoppe Seyler's Zeitschrift fur Physiologische Chemie, 365(9), 1984. 1097-1106.
GENETICS; HAEMOGLOBIN.
The Hb from a lowland tapir (Tapirus terrestris) were analyzed and the complete primary structure is described. The globin chains were separated on CM cellulose column in 8 M urea and the amino-acid sequences were determined in the liquid phase sequenator. Globin consists of 2 .alpha. chains (.alpha.I and .alpha.II) and .beta. major and .beta. minor components. The .alpha. chains differ only at 1 position: .alpha.I contains Asp and .alpha.II Gly. The .beta. chains are heterogeneous: Asp and Glu are at positions .beta.21 and . beta.73 of the .beta. major components and Asn and Ser at position .beta.139. In the .beta. minor components 4 positions had more than 1 amino acid, namely . beta.2, .beta.4, .beta.6 and .beta.56. The sequences are compared with those of man, horse and rhinoceros. Four residues of horse metHb, which are involved in the .alpha._I_beta.1 contacts are substituted in tapir Hb. In the .alpha. chains: .alpha.107(G14) Ser .fwdarw. Val, .alpha.111(G18) Val .fwdarw. Leu, . alpha.115 (GH3) Asn .fwdarw. Asp or Gly; in the .beta. chains: .beta.116(G18) Arg .fwdarw. Gln. The amino acid at .beta.2 of the major components is Glu while Gln and His are in the minor components. Although Glu, a binding site for ATP, does not interact with 2,3-bisphosphoglycerate, Gln and His in the minor components are responsible for the slight effect of 2, 3-bisphosphoglycerate on tapir Hb. 202. German.

PRASAD C HILTON, C W SVEC, F ONAIVI, E S VO, P Could dietary proteins serve as cyclo His Pro precursors.
Neuropeptides, 19(1), 1991. 17-22.
DIET; PROTEINS; ENDOCRINOLOGY; NEUROPEPTIDES.
Cyclic dipeptides or diketopiperazines are readily generated during in vitro hydrolysis of proteins and polypeptides. This led us to examine whether cyclo(His-Pro) (CHP), a diketopiperazine containing histidine and proline, could be formed in vivo for dietary proteins. The data presented here show that at least in rat, neither urinary nor plasma concentration of CHP is elevated by consumption of a diet rich in proteins. Several dietary supplements derived from casein and/or soy protein hydrolysates, however, contain high levels of CHP-LI. Oral intake of one such supplement led to a sharp increase in the plasma level of CHP-LI. 54.

SEAL, U S BARTON, R MATHER, L GRAY, C W Baseline laboratory data for the white rhinoceros (Ceratotherium simum simum).
Journal of Zoo Animal Medicine, 7(1), 1976. 11-16; 7 ref.
HORMONES; BLOOD.

STRATIL, A BOBAK, P KALAB, P CIZOVA, D POKORNY, R Serum proteins of rhinoceroses inter-specific and intra-specific variation.
Comparative Biochemistry and Physiology B Comparative Biochemistry, 95(4), 1990. 803-810.
PROTEINS; SERUM.
1. Serum proteins of Ceratotherium simum cottoni Lydekker (C. s. cottoni), Diceros bicornis L. (D. bicornis) and Rhinoceros unicornis L. (R. unicornis) were studied by 1D PAGE, 2D agarose-PAGE, immunoblotting and inhibitions of trypsin and chymotrypsin. 2. In all species studied albumin, transferrin, . alpha.1B glycoprotein, vitamin D binding protein (GC), .alpha.2HS glycoprotein, haptoglobin, haemopexin, ceruloplasmin, esterase and protease inhibitors were found. 3. 1D PAGE and 2D agarose-PAGE patterns of serum proteins of rhinoceroses were found to be species-specific. 4. In C. s. cottoni intra-specific variation was observed in vitamin D binding protein (GC), protease inhibitors AC and ATC2 and haptoglobin. Less well defined variation was also detected in protease inhibitor ATC1, a postalbumin (PSA) and an esterase (ES3). 107.

TURKSTRA, J HARTHOORN, A M BEUKES, P J L BRITS, R J N The influence of seasonal changes in the concentration of trace elements in liver tissue of various wild animals determined by instrumental neutron activation analysis.
Journal of Radioanalytical Chemistry, 37(1), 1977. 473-481.
TRACE ELEMENTS.

VAN HEERDEN, J KEFFEN, R H DAUTH, J DREYER, M J Blood chemical parameters in free-living white rhinoceros Ceratotherium simum.
Journal of the South African Veterinary Association, 56(4), 1985. 187-189.
BLOOD.
Serum concentrations of sodium, potassium, chloride, total protein, albumin, aspartate transaminase, creatine kinase, lactate dehyrogenase, gamma-glutamyltranspeptidase, alkaline phosphatase and alanine transaminase were determined in free-living white rhinoceroses Ceratotherium simum (n = 20). Single serum cortisol (n = 20), oestradiol-17 Beta (n = 14) and progesterone (n = 14) concentrations are also presented. Low serum sodium (129.6. +-. 4.2 mmol/l) chloride (94.2.+-. 3.05 mmol/l) and albumin (26.1.+-. 3.71 mmol/l) as well as high globulin (alpha 1, alpha 2, beta and gamma) concentrations were outstanding features. 184.

BOOKS

The last rhino.
1993. Johannesburg: Southern Book Publishers.
BOOKS.

BAILEY, J Mission Rhino.
1990. 46pp. London: Heinemann.
BOOKS; POACHING.
A young African boy learns why rhinoceros are hunted and why it is important to protect them from poachers.

BALFOUR, D BALFOUR, S Rhino; the story of the rhinoceros and a plea for its conservation.
1991. Cape Town: Struik.
BOOKS.

BOOTH, M Rhino road; the black and white rhinos of Africa.
1992. London: Constable.
BOOKS; DESCRIPTION.

CAPTIVE BREEDING SPECIALIST GROUP Kenya black rhino metapopulation workshop.
1993. Apple Valley MN: Captive Breeding Specialist Group.
BOOKS.

*DAVIS, J G Operation Rhino.
1972. 224. London: Michael Joseph.
BOOKS; CAPTURE; TRANSLOCATION.

*GUGGISBERG, C A W S.O.S. Rhino.
1966. London: Andre Deutsch.
BOOKS; DISTRIBUTION; STATUS; BEHAVIOUR; TAXONOMY; HORN; MORPHOLOGY.

HARE, J Rhino horn.
1988. 28pp. London: Hodder and Stoughton.
BOOKS.

*MARTIN, E B MARTIN, C B Run rhino run.
1982. 136pp. London: Chatto and Windus.
POACHING; BOOKS.

MERZ, A From the brink of extinction.
1991. 212pp. Collins.
BOOKS.

MERZ, A Rhino at the brink of extinction.
1991. 220pp. Harper Collins.
BOOKS; POACHING.

MUNN, A F Extinction is forever.
1990. Harare: Key Plan.
BOOKS.

MUNN, A F Extinction is forever; the Rhino girls' story.
1990. s.l.: Safari Connection.
BOOKS.

O'DONOGHUE, B Black rhino rescue.
1976. 115pp. Johannesburg: Perskor.
BOOKS.

*PENNY, M Rhinos; endangered species.
1987. 116pp. London: Christopher Helm.
BOOKS; HORN.

PITMAN, D BURR, S (ILLUS) Rhinos; past, present and future?.
1991. Harare: Roblaw.
DESCRIPTION; BOOKS.

*PLAYER, I The white rhino saga.
1972. 254pp. London: Collins.
BOOKS; CAPTURE.

RIDDLE, G The rhino rescue.
1988. 28pp. Harare: s.n.
FICTION; BOOKS.

SANFORD, W R The African rhino.
1990. 48pp. Oxford: Heinemann.
BOOKS.

*SCHENKEL, R *SCHENKEL-HULLIGER, L Ecology and behaviour of the black rhinoceros (Diceros bicornis L): a field study.
1969. 101. Hamburg and Berlin: Paul Parey.
ECOLOGY; MORPHOLOGY; BOOKS.

TORGERSEN, D A Elephant herds and rhino horns.
1981. 47pp. Chicago: Children's Press.
BOOKS.
Text and photographs feature the physical characteristics, territories, feeding habits and behaviour in the wild and in zoos of the world's largest land mammals, including rhinos..

BREEDING

ANON Northern white rhino: survival chances increase.
IUCN Bulletin, 17(4-6), 1986. 78, illus.
CONSERVATION.

ANON Tabulated data on the breeding biology of the black rhinoceros Diceros bicornis compiled from reports in the yearbook..
International Zoo Yearbook, 7, 1967. 166.
ECOLOGY; ZOOS.

ANON The first rhino calves born in Kruger.
Oryx, 8, 1965. 32.
KRUGER NATIONAL PARK.

BANKS, M Breeding the black rhinoceros in Great Britain.
IZN (International Zoo News), 33(5-6), 1986. 10-15, illus.
UNITED KINGDOM; CONSERVATION; ZOOS.

BLAZKIEWTTZ, B Nashorner im Zoo.
Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin (N.F), 23, 1983. 54-57.
ZOOS; GERMANY; BREEDING; REPRODUCTION.
GERMAN.

COHN, J P Captive breeding for conservation.
Bioscience, 38(5), 1988. 312-316.
BREEDING.

FRESE, R Das Europaische Erhaltungszuchtprogramm fur Spitzmaulnashorner (Diceros bicornis).
Bongo, 15, 1989. 101-104.
EUROPE; CONSERVATION.
European breeding programme strategies. German Summary in English.

*GOWDA, C D K Breeding the black rhinoceros Diceros bicornis at Mysore Zoo.
International Zoo Yearbook, 7, 1967. 163-164.
ECOLOGY; ZOOS.

*GREED, G R Notes on the breeding of the black rhinoceros, Diceros bicornis, at Bristol zoo.
International Zoo Yearbook, 7, 1967. 158-161.
GROWTH; ECOLOGY; UNITED KINGDOM; ZOOS.

*HALLSTROM, E Notes on breeding the black rhinoceros Diceros bicornis at Sydney Zoo.
International Zoo Yearbook, 7, 1967. 165.
ECOLOGY; AUSTRALIA; ZOOS.

*HILLMAN-SMITH, K Northern white rhinos born at Garamba.
Pachyderm, 10, 1988. 22.
BREEDING; GARAMBA NATIONAL PARK.

*JARVIS, C Tabulated data on the breeding biology of the black rhinoceros compiled from reports in the Yearbook.
International Zoo Yearbook, 7, 1969. 166.
ZOOS.

MANTON, V J A Breeding of rhinoceroses at Whipsnade.
Proceedings of the Symposium of the Association of British Wild Animal Keepers, 7, 1983. 39-40.
BREEDING; ZOOS; UNITED KINGDOM; WHIPSNADE ZOO.

#RAWLINS, C G C The breeding of white rhinos in captivity - a comparative survey.
Zoologische Garten, 49, 1979. 1-7.
ZOOS; BREEDING.

RIECHES, R Rhinoceros breeding at the San Diego Wild Animal Park. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 296-298. San Diego: Zoological Society of San Diego.
REPRODUCTION; SAN DIEGO WILD ANIMAL PARK.

SVITALSKY, M VAHALA, J SPALA, P Breeding experience with northern white rhinos (Ceratotherium simum cottoni) at Zoo Dvur Kralove. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 282-286, illus. San Diego: Zoological Society of San Diego.
BREEDING; CZECH REPUBLIC; ZOOS.

CAPTIVE CARE

*CRANDALL, L S Family Rhinocerotidae - rhinoceroses. IN: The Management of Wild animals in Captivity.
1964. 504-520. Chicago: University of Chicago Press.
ZOOS; CAPTIVE CARE.

ERIKSEN, E Birth of 2 white rhinoceroses Ceratotherium simum simum at the Copenhagen Denmark Zoo.
Zoologische Garten, 47(1), 1977. 33-44.
DENMARK; ZOOS; CALF; FEEDING.

KOURIST, W Addendum to Part 1 and Part 2 of the Early care of large mammals.
Zoologische Beitrage, 20(3), 1974. 543-546.
ZOOS.

*KREAG, K K Hand-rearing a black rhinoceros, Diceros bicornis, at Detroit Zoo.
International Zoo Yearbook, 6, 1966. 87-88.
ZOOS; REARING; UNITED STATES; GROWTH.

MATTHEWS, M Birth of a white rhinoceros in captivity.
Journal of Zoo Animal Medicine, 4(1), 1973. 18.
BIRTH; ZOOS.

OCONNOR, S M Activity cycles of the southern white rhinoceros Ceratotherium-simum-simum in captivity; implications for management.
International Zoo Yearbook, 24/25, 1986. 297-303, illus.
ECOLOGY; ZOOS; BREEDING.

ROGERS, P S Care of the black rhinoceros Diceros bicornis in captivity. IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 558-561. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
CAPTIVE CARE.

ROGERS, P S Care of the white rhinoceros Ceratotherium simum in captivity, IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 546-553. Pretoria: Wildlife Decision Support Services; South African Veterinary Foundation.
CAPTIVE CARE.

ROGERS, P S Hand-raising of orphaned rhinoceros calves, IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 562-569. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
CALF; REARING.

*SHELDRICK, D Raising a baby rhino.
Pachyderm. 8, 1987. 17-18.
DIET; REARING; CALF; GROWTH.

SHELDRICK, D Raising a baby rhino.
Swara, 10(5), 1987. 15-17, illus.
DIET; CALF; REARING.

TRENDLER, K Hand-rearing rhino calves.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 162-163 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
REARING; CALF.

*WALLACH, J D Hand-rearing and observations of a white rhinoceros, Diceros s. simus.
International Zoo Yearbook, 9, 1969. 103-104.
GROWTH; BEHAVIOUR; REARING.

CAPTURE

BOOTH, V R COETZEE, A M The capture and relocation of black and white rhinoceros in Zimbabwe. In: Translocation of wild animals [edited by Nielsen, L. and Brown, R.D.].
1988. 191-209; 26 ref. Milwaukee, Wisconsin 53212, USA: Wisconsin Humane Society, Inc.
DRUGS; ZIMBABWE; IMMOBILISATION/DRUGS; RESTRAINT.
Zimbabwe.

*BROOKS, P The rhinoceros at bay.
Horizon, Winter, 1967. 15-21, 116-117.
CAPTURE; TRANSLOCATION.

*CARTER, N The arm'd rhinoceros.
1965. 284. London: Andre Deutsch.

*CHILD, G FOTHERGILL, R Techniques used to rescue black rhinoceros (Diceros bicornis) on Lake Kariba, Southern Rhodesia, Kariba Studies.
1962. 37-41. National Museums of Southern Rhodesia.
TRANSLOCATION; LAKE KARIBA.

*COLTMAN, O Rhino capture.
Tshomarelo News, 21, 1985. 13-14.
CAPTURE.

*CONDY, J B The capture of black rhinoceros (Diceros bicornis) and buffalo (Syncerus caffer) on Lake Kariba.
Rhodesian Journal of Agricultural Research, 21(1), 1964. 31-34.
CAPTURE; IMMOBILIZATION; PHYSIOLOGY; LAKE KARIBA; TRANSLOCATION.

*DAVIS, J G Operation Rhino.
1972. 224. London: Michael Joseph.
BOOKS; CAPTURE; TRANSLOCATION.

DENSHAM, W D A method of capture and translocation of wild herbivores using opaque plastic material and a helicopter.
Lammergeyer, 21, 1974. 1-25. TRANSLOCATION MANAGEMENT MORTALITY

*EBEDES, H Tweede voorlopige handleiding vir die vang, vervoer, aanhou en hervestiging van swart renosters Diceros bicornis (Linn. 1758) in Suidwes-Afrika.
Internal report. SWA Directorate of Nature Conservation.
NAMIBIA; IMMOBILISATION/DRUGS; TRANSLOCATION.

*ELTRINGHAM, S K The rescue of distressed large mammals in national parks using drug immobilization.
East African Wildlife Journal, 12, 1974. 235-238.
DRUGS; IMMOBILISATION/DRUGS.

FERGUSON, J W H SWART, M K J MCKENZIE, A A Implications of G-6PD allozymes for capture and care of black rhinoceros.
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 81. Pretoria: South African Veterinary Association Wildlife Group.
CAPTURE.

FLAMAND, J R B ROCHAT, K KEEP, M E An instruction guide to the most commonly and successfully used methods in rhino capture, handling, transport and release. IN: CORDFIEL, T (Ed). The wilderness guardian. 1984. Nairobi: Nairobi Space Publishing.
TRANSPORTATION.

*FOTHERGILL, R Diaries covering rhino capture operations. unpublished. Rhodesia: Department of National Parks and Wildlife Management.
IMMOBILISATION/DRUGS; TRANSLOCATION.

GELDENHUYS, L Black rhinoceros Diceros bicornis capture and translocation techniques as used in Etosha National Park Namibia. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 86-87.
ETOSHA NATIONAL PARK; TRANSLOCATION.

GELDENHUYS, L Black rhinoceros (Diceros bicornis) capture and translocation techniques and boma management as used in Namibia. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 307-310, illus. San Diego: Zoological Society of San Diego.
CAPTURE; TRANSLOCATION; NAMIBIA; HOUSING.

*GUSH, R To save a rhino.
African Wildlife, 18(3), 1964. 197-201.
IMMOBILISATION/DRUGS; POACHING.

*HARTHOORN, A M Ataractic hypnotic and narcotic mixtures for the capture and handling of large wild animals.
British Veterinary Journal, 119, 1963. 47-63.
DRUGS; IMMOBILISATION/DRUGS.

#HARTHOORN, A M Capture of the white rhinoceros (Ceratotherium S.Simum Burchell) with the use of drug immobilization technique.
Canadian Journal of Comparative Medicine, 26, 1962. 203.
IMMOBILISATION/DRUGS; DRUGS.

*HARTHOORN, A M Operation Noah - the black rhino rescue.
Black Lechwe, 2(5), 1960. 179-183.
IMMOBILISATION/DRUGS; TRANSLOCATION.

HARTHOORN, A M The chemical capture of animals.
1976. xvi + 416pp.; 16 pl. London, UK: Baillicre Tindall.
IMMOBILISATION/DRUGS; DRUGS; RESTRAINT.
The chemical capture of wild animals seems so easy when viewed from the safety of a library, but Daniels who carefully read this book may think again before taking their syringe launchers into the lions' den. After reading of ways by which some or all of the dose may be lost from a syringe without being injected, thoughtful hunters may be forgiven for any diffidence in their approach to victims. However, now that morphinomimetic compounds are available to combine with tranquillizers, most of the difficulties and dangers to the patient have disappeared. The enormous amount of data in this book will be appreciated by all who need to use the technique of chemical capture. Details of drugs and equipment are sufficient and supplemented by much practical information in the appendices. The methods of using them are written in a way that is easy to understand and, in any case, will normally be augmented by additional reading from the comprehensive bibliography. The photographs are wonderful but disturbing: who, for example, can remain unmoved at the sight of an open tractor trailer full of lions? A long section on mechanical capture is informative and interesting; this is often used as a first step in chemical capture. This splendid book is an excellent presentation of the meat from a vast amount of literature; it is designed only for "the professional person" but will surely appeal to all who are literate and have any interest in wildlife..

*HARTHOORN, A M The flying syringe.
1970. 287. London: Geoffrey Bles.
IMMOBILISATION/DRUGS.

*HARTHOORN, A M LOCK, J A The rescue of rhinoceroses at Kariba dam.
Oryx, 5(6), 1960. 352-355.
LAKE KARIBA; IMMOBILISATION/DRUGS.

HENWOOD, R R Black rhinoceros Diceros bicornis capture transportaton and boma management by the Natal Parks Board South Africa. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 43-48.
IMMOBILISATION/DRUGS; DRUGS; NATAL PARKS BOARD.

HITCHINS, P M KEEP, M E ROCHAT, K The capture of black rhinoceros in Hluhluwe Game Reserve and their translocation to the Kruger National Park.
Lammergeyer, (17), 1972. 18-30.
HLUHLUWE GAME RESERVE; KRUGER NATIONAL PARK; TRANSLOCATION; DRUGS; STATUS; IMMOBILISATION/DRUGS.

HOFMEYR, J M EBEDES, H FRYER, R E M DE BRUINE, J R The capture and translocation of the black rhinoceros Diceros bicornis in South-West Africa.
Madoqua, 9(2), 1975. 35-44.
NAMIBIA; DRUGS; IMMOBILISATION/DRUGS; TRANSLOCATION.
Between 1970-1972, 43 black rhinoceroses D. bicornis Linn., were darted from a helicopter and transferred to the Etosha National Park, where they have become well established and now constitute a viable population. Using an etorphine/azaperone combination, a mean immobilization time of 8 min 22 s was obtained. A multi-lift system fitted to the transport vehicle facilitated the loading of rhinos in difficult terrain. Clinical observations, immobilization data, sex and estimated age of the rhinos captured are presented and discussed. Serum transaminase values were obtained from 9 of the rhinos captured. 309.

HOFMEYR, J M DE BRUINE, J R The problems associated with the capture translocation and keeping of wild ungulates South-West Africa.
Lammergeyer, (18), 1973. 21-29.
TRANSLOCATION; NAMIBIA.

KEEP, M E The problems associated with the capture and translocation of the black rhinoceros in Zululand Republic of South Africa.
Lammergeyer, (18), 1973. 15-20.
TRANSLOCATION; DRUGS; ZULULAND; IMMOBILISATION/DRUGS.

KING, I M The capture and translocation of the black rhinoceros.
East African Wildlife Journal, 7, 1969. 115-130.
TRANSLOCATION; DRUGS; IMMOBILISATION/DRUGS.

KOCK, M D Capture and translocation of the black rhinoceros (Diceros bicornis) in Zimbabwe: management modifications to reduce stress and mortalities. IN: RYDER, O A (Ed). Rhinoceros biology and conservation. Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 315-324, illus. San Diego: Zoological Society of San Diego.
CAPTURE; TRANSLOCATION; ZIMBABWE.

KOCK, M D MORKEL, P Capture and translocation of the free-ranging black rhinoceros; medical and management problems.
Zoo and wild animal medicine; current therapy 3, ed. by M.E.Fowler, 1993. 466-475. Philadelphia: W B Saunders.
TRANSLOCATION; VETERINARY MEDICINE AND SURGERY.

*MCCULLOCH, B ACHARD, P L Mortalities associated with the capture, translocation, trade and exhibition of black rhinoceroses.
International Zoo Yearbook, 9, 1969. 184-191.
MORTALITY; TRANSLOCATION; TRADE.

*MCCULLOCH, B ACHARD, P L Mortality in the capture of game animals.
Oryx, 8 (2), 1965. 131-140.
MORTALITY.

ROGERS, P Capture, post-capture care and transportation of white rhino Ceratotherium simum.
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 77. Pretoria: South African Veterinary Association Wildlife Group.
TRANSPORTATION.

ROGERS, P S Chemical capture of the black rhinoceros. IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 553-556. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
DRUGS.

ROGERS, P S Chemical capture of the white rhinoceros Ceratotherium simum. IN: MCKENZIE, A A (Ed). The Capture and care manual; capture, care, accommodation and transportation of wild African animals.
1993. 512-529. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
DRUGS.

*SAVIDGE, J Catching and carting white rhino in Uganda.
Oryx, 8(2). 1965. 88-93.
CAPTURE; UGANDA.

SHAPCOTT, P Catching the black rhinoceros for transportation at Bristol Zoo.
RATEL, 12(4). 1985. 108-113, illus.
TRANSPORTATION; UNITED KINGDOM; ZOOS.

*THOMSON, W R Reports covering black rhinoceros capture operations.
1964 1965 1967-1970. Rhodesia: Department of National Parks and Wildlife Management.
IMMOBILISATION/DRUGS; TRANSLOCATION.

#VAGNER, J Capture and transport of animals from Africa to the Zoological Gardens of Dvur Kralove n.L..
Proceedings of the International Symposium on Zoo Animals, 1973. 179-186.
TRANSPORTATION.

CENSUSING

ANON Air count.
Lammergeyer, 2 (2). 1962. 48-49.
POPULATIONS.

CAUGHLEY, G GODDARD, J Improving the estimates from inaccurate censuses.
Journal of Wildlife Management, 36(1). 1972. 135-140.
POPULATIONS.

CILLIERS, A Monitoring methods and techniques for censusing black rhinoceros Diceros bicornis bicornis in Etosha National Park.
Koedoe, 32(2), 1989. 49-60.
BEHAVIOUR; ETOSHA NATIONAL PARK.

CILLIERS, A Monitoring methods and techniques for censusing black rhinoceros Diceros bicornis in Etosha National Park, Namibia, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31- September 4, 1988.
Koedoe, 32(2), 1989. 49-60.
ETOSHA NATIONAL PARK; POPULATIONS.

GODDARD, J Aerial census of black rhinoceros using stratified random sampling.
East African Wildlife Journal, 7, 1969. 105-114.
POPULATIONS.

*GODDARD, J Rhino spotting from a plane.
Oryx, 10(3), 1969. 146.
DISTRIBUTION.

*GODDARD, J The validity of censusing black rhinoceros populations from the air.
East African Wildlife Journal, 5, 1967. 18-23.
ECOLOGY.

HILLMAN, K Towards the interpretation of aerial sample census data for rhinos. IN: CUMMING, D H M & JACKSON, P (eds). The status and conservation of Africa's elephants and rhinos.
1984. 78-91, illus. Gland: International Union for Conservation of Nature and Natural Resources.
STATUS; POPULATIONS.

HITCHINS, P M Census and marking systems for black rhinoceros Diceros bicornis, with special reference to the Zululand game reserves.
The Game Ranger, Dec, 1990. 1-12.
ZULULAND.

HITCHINS, P M Census and marking systems for black rhinoceros Diceros bicornis with special reference to the Zululand Game Reserves South Africa. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 84-85.
ZULULAND.

HOFMEYR, J M Method of censusing and the status of the black rhinoceros Diceros bicornis in the Etosha National Park Namibia South-West Africa. IN: Symposium on the Zoology of Arid and Semi-arid Environments, Swakopmund, Namibia, July 24-27, 1983.
South African Journal of Science, 80(4), 1984. 187.
POPULATIONS; MIGRATION; POACHING; ETOSHA NATIONAL PARK; STATUS.

KNOTT, A P VENTER, J A field test on the accuracy and repeatability of a line transect method.
LAMMERGEYER, 41, 1990. 13-22, illus.
POPULATIONS.
Population censusing, line transect method evaluation.

CONSERVATION

The last rhino.
1993. Johannesburg: Southern Book Publishers.
BOOKS.

ANON Assessing conservation priorities. IN: CUMMING, D H M & JACKSON, P (Eds). The status and conservation of Africa's elephants and rhinos.
1984. 24-45, illus. Gland: International Union for Conservation of Nature and Natural Resources.
CONSERVATION.

ANON Black rhino endangered.
Bulletin Field Museum of Natural History, 52(1), 1981. 30-31.
CONSERVATION; KENYA.

ANON Black rhino rescue campaign.
African Wildlife, 24, 1970. 255.
CONSERVATION.

ANON Black rhinos established in Rhodesian reserve.
International Zoo News, 20 (2), 1973. 56.
ZIMBABWE.

ANON Black rhinos to Rhodesia.
Oryx, 12, 1973. 178.
ZIMBABWE.

ANON Conservation of species and the endangered rhinoceros. 99th Congress, 2nd Session, No.156.
1986. 93-115. Washington, D.C: US Government Printing Office.
UNITED STATES.

ANON Conservationists attack Zimbabwe.
Pretoria News, 9 July 1994.
ZIMBABWE.
Zimbabwe, once home to the largest concentration of black rhinos in the world, is under attack by conservationists for not injecting enough cash and political will to save the endangered animals..

ANON Final priorities for the action plan. IN: CUMMING, D H M & JACKSON, P (Eds). The status and conservation of Africa's elephants and rhinos. 1984. 11-17. Gland: International Union for Conservation of Nature and Natural Resources.
CONSERVATION.

ANON Gift of rhino.
Farmer's Weekly, 79043, 1989. 97.
CONSERVATION.

ANON Rescues in Rhodesia.
Oryx, 10, 1970. 361.
ZIMBABWE.

ANON Return of the rhino?.
Natura; wildlife magazine, 8, Oct/Dec 1985. 16-18.
CONSERVATION.

ANON Rhinos come to Swaziland.
Oryx, 8, 1962. 32.
SWAZILAND.

ANON Rhinos resettled.
Natura; wildlife and safari magazine, 22, Dec 1990-Feb 1991. 40-42.
CONSERVATION.

ANON Square-lipped rhino's 370-mile trip.
African Wildlife, 15, 1961. 278-279.
TRANSLOCATION.

ANON Square-lipped rhinoceros.
IUCN Bulletin, 1 (12), 1964. 5.
DESCRIPTION.

ANON The Endangered Wildlife Trust in Southern Africa.
(undated ?1981). 12pp. Bedfordview, SA: Endangered Wildlife Trust.
CONSERVATION.

ANON The survival of rhino; fact or fiction?.
Natura; wildlife and safari magazine, 23, Feb/March 1991. 4-7.
CONSERVATION.

ANON White rhino arrive at Manyeleti.
African Wildlife, 22, 1968. 340-341.
MANYELETI.

ANON Whither the black rhino?.
Conservationist, Salisbury, 41-42, 1986. 2pp.
CONSERVATION; ZIMBABWE.

ANON World-wide campaign to save the rhino.
International Zoo News, 26(6), 1979. 20-21.
CONSERVATION.

ANSTEY, S An evaluation of WWF rhino projects, 1961-1987.
1987. MSc thesis (Conservation). London: University College of London.
THESES; WORLD WILDLIFE FUND.

BAILEY, J Mission Rhino.
1990. 46pp. London: Heinemann.
BOOKS; POACHING.
A young African boy learns why rhinoceros are hunted and why it is important to protect them from poachers.

BALFOUR, D BALFOUR, S Rhino; the story of the rhinoceros and a plea for its conservation.
1991. Cape Town: Struik.
BOOKS.

BASKIN, Y Archaeologist lends a technique to rhino protectors.
Bioscience, 41 (8), 1991. 532-534.
CONSERVATION.

BERGER, J CUNNINGHAM C Black Rhino Conservation.
Science, 264(5160), MAY 6 1994. 757, Letter.
CONSERVATION.

BERGER, J Science, conservation and black rhinos.
Journal of Mammalogy, 75 (2), 1994. 298-308.
BEHAVIOUR.
The study of adaptive traits rarely has been applied toward the conservation of biodiversity. Fields such as evolution, biogeography, behavioral ecology, population biology, and genetics have facilitated conservation goals, but only partially and only for a few taxa. Among the world's most endangered mammalian families is the Rhinoceratidae whose five species are being exterminated for their horns. Numerous conservation actions have been applied to these species. The most radical, horn removal, is designed to improve the conservation of both black (Diceros bicornis) and white (Ceratotherium simum) rhinos. In this paper, I use basic and applied biology to suggest how science has or has not contributed to the in situ conservation of black rhinos. I make four points: knowledge about associations between mating systems and sexual dimorphism has helped illuminate the evolution of secondary sexual traits; relationships between behavioral responses of black rhinos to dangerous predators and subsequent mortality are of basic interest, but this knowledge has not abetted rhino conservation; prior literature indicates that the young of horned mothers regularly are maimed by dangerous predators (if horns have utility as defensive structures, then phenotypic alterations of female horns should increase the susceptibility of young to predation, a prediction with empirical support from a Namib Desert population); because wild populations of black rhinos have been depleted in the past 25 years by 97%, it makes little sense to plan how to conserve genetic diversity over the next 500. Science will continue to play a critical role in the future conservation of small, heavily managed populations. However, it is less likely to be of major significance in the in situ conservation of rhinos until sociological, economic, and political issues are effectively resolved..

*BIGALKE, R Nature conservation in the Transvaal.
Oryx, 9(6), 1968. 426-430.
TRANSVAAL; CONSERVATION.

*BIGALKE, R The extermination of the square-lipped or white rhinoceros (ceratotherium simum simum (Burch)) in Transvaal and its reintroduction. A historical and critical review.
Fauna and Flora, 14, 1963. 5-14.
TRANSVAAL; EXTERMINATION.

*BIGALKE, R Wild life conservation in the Union of South Africa: historical introduction.
Fauna and Flora, 1, 1950. 5-9.
CONSERVATION; SOUTH AFRICA.

BRAUDE, S Elephant and rhinoceros conservation in Kenya.
Endangered Species Update, 9(3), 1992. 1-4, illus.
KENYA.

BRETT, M Return of the rhino; time is running out.
Natura, 8, 1985. 16, 34-35.
STATUS.

BRETT, R Are Kenya's rhinos recovering?.
Swara, 14(1), 1991. 8-14, illus.
KENYA; POPULATIONS.

BUITRON, D Chizarira: the black rhino's last Eden.
Swara, 12(2), 1989. 25-27, illus.
CHIZARIRA NATIONAL PARK; ZIMBABWE.

BUITRON, D A Namibia: leading the way in wildlife conservation.
Swara, 14(2), 1991. 28-31, illus.
NAMIBIA.

CAYFORD, P LEBRUN, N The Rhino war; a desperate fight to save an endangered species.
1987. Washington: National Geographic Society.
VIDEOS.
Videocassette (60 minutes)..

*CONDY, J B *DAVISON, E The importation of eight square-lipped rhinoceros (Ceratotherium simum simum) to southern Rhodesia.
African Wildlife, 18(1), 1964. 13-21.
ZIMBABWE.

COOPER, K A haven for rhinos; Zimbabwe's Bubiana Conservancy.
African Wildlife, 48 (1), 1994. 17-21.
BUBIANA CONSERVANCY; ZIMBABWE.

CUMMING, D Zimbabwe and the conservation of black rhino.
Zimbabwe Science News, 21(5-6), 1987. 59-62.
ZIMBABWE; STATUS.

CUMMING, D H M DU TOIT, R F STUART, S N African elephants and rhinos; status survey and conservation action plan.
1990. 72pp. Gland: IUCN.
STATUS.
The conservation situation surrounding Africa's elephants and rhinos is evolving very rapidly. This document describes the situation as it was in 1987 in detail and presents a number of recommended actions..

DE GRAAFF, G RAUTENBACH, J C Rhinoceros conservation workshop Skukuza Kruger National Park South Africa August 31-September 4 1988.
Koedoe, 32(2), 1989. 1-123.

EMSLIE,R H Regional conservation goals for black rhinos in Namibia/South Africa.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 50-54 Pretoria: South African Veterinary Association Wildlife Group, University of Pretoria.
CONSERVATION; SOUTH AFRICA; NAMIBIA.

*FADDY, M Save the Rhino Trust Limited. Annual report 1982.
1982. Mimeo Lusaka: SRT.
ECOLOGY.

FICHAT, S Finances the vital factor in rhinoceros conservation. In: Rhinoceros conservation workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 81.
FINANCES; CONSERVATION.

FINNLEY, D (ED.) Rulemaking actions, October 1979. Black rhino proposed as endangered.
Endangered Species Technical Bulletin, 4(11), 1979. 4.
US ENDANGERED SPECIES ACT, 1973; LEGISLATION.

FRIEDRICH, S FRIEDRICH, W The great rhino walk. A 200 km hike through the Damaraland to raise funds for the rapidly dwindling black rhino population.
Mitteilungen Namibia Wissenschaftliche Gesellschaft, 32(3-4), 1991. 25-34, illus.
NAMIBIA; POACHING.

*GRZIMEK, B Rhinos belong to everybody.
1964. London: Collins.
ECOLOGY.

*HAMILTON, P H KING, J M The fate of black rhinoceros released in Nairobi National Park.
East African Wildlife Journal, 7, 1969. 73-83.
NAIROBI NATIONAL PARK; BEHAVIOUR.

HEARNE, J SWART, J GOODMAN, P A conservation model for black rhino.
Orion, 7(1), 1991. 25-37.
CONSERVATION.

*HILLMAN, K Introduction of black rhino.
Tshomarelo News, 2, 1981. 5-11.
CONSERVATION.

*HILLMAN, K New black rhinos.
Tshomarelo News, 5, 1982. 18-19.
CONSERVATION.

HILLMAN, K The last refuge of the northern white rhino.
Swara, 8(2), 1985. 20-21, illus.
ZAIRE; GARAMBA NATIONAL PARK; POPULATIONS.

HILLMAN SMITH, K OYISENZOO, M M SMITH, F A last chance to save the northern white rhinoceros Ceratotherium simum cottoni.
Oryx, 20(1), 1986. 20-26.
ZAIRE; STATUS.

HILLMAN-SMITH, K Rhino conservation in Garamba National Park.
Pachyderm, 13, 1990. 39-41.
GARAMBA NATIONAL PARK.

HIRJI, K N A survey of wildlife populations in Tanzania and their potential for research IN: JEWELL, P A and MALOIY, G M O (Ed). Symposia of the Zoological Society of London, no. 61. The Biology of large African mammals in their environment.
Symposium, London, England, UK, May 19-20, 1988, 1989. 253-266. illus, maps. ISBN 0-19-854009-4. New York: Oxford University Press
POPULATIONS; TANZANIA; NATIONAL PARKS.

HOLT-BIDDLE, D The Black Rhino: can it be saved by co-operation and education?.
Environmental Education Bulletin, 1, July 1989. 6-7.
ENVIRONMENTAL EDUCATION.

JACKSON, F R Elephant and rhino experts plan survival strategies.
Environmental Conservation, 8(4), 1981. 321-322.
CONSERVATION; ECONOMICS; TRADE; HORN; ECOLOGY; POPULATIONS.

JACKSON, P (ED.) Elephants and rhinos in Africa; a time for decision.
1982. 1-36. s.l.: IUCN.
CONSERVATION; STATUS; DISTRIBUTION.

JACKSON, P F R Black rhinos moved 600 miles to sanctuary in Rhodesia.
Biological Conservation, 4(3), 1972. 226-227.
TRANSLOCATION; ZIMBABWE.

JESSUP, D A CLARK, R K KOCK, M D MORKEL, P Conservation of black rhino in Namibia and Zimbabwe; veterinary contributions.
Proceedings of the American Association of Zoo Veterinarians, 1991, 1991. 379-382.
NAMIBIA; ZIMBABWE; VETERINARY MEDICINE AND SURGERY.

JESSUP, D A KOCK, M D Research opportunities on free-ranging black rhinoceros captured for relocation and collaboration with captive rhino research.
Proceedings of the American Association of Zoological Parks and Aquariums Regional Conference, 1990. 174-178.
RESEARCH.

JOHNSON, P Success story of Africa's white rhino.
Wildlife, London, 21(5), 1979. 28-30.
CONSERVATION; ECOLOGY; POPULATIONS.

KHAN, F Beyond the white rhino.
African Wildlife, 44(6), Nov 1990. 321-324.
ENVIRONMENTAL EDUCATION.

LAMB, R New moves to help save East Africa's wildlife.
Environmental Conservation, 8(1), 1981. 71-72.
CONSERVATION; EAST AFRICA; NATIONAL PARKS; ECONOMICS; TRADE; HORN.

LAMBRECHTS, A The numerical status of 16 game species in the Transvaal South Africa excluding the Kruger National Park.
Journal of the Southern African Wildlife Management Associationn, 4(2), 1974. 95-102.
STATUS; TRANSVAAL.

LEADER WILLIAMS, N ALBON, S D Allocation of resources for conservation.
Nature, 336(6199), 1988. 533-535.
NATIONAL PARKS.

LEADER WILLIAMS, N Black rhinos and African elephants lessons for conservation funding.
Oryx, 24(1), 1990. 23-29.
FUNDING; TRADE.

LEADER-WILLIAMS, N Theory and pragmatism in the conservation of rhinos, IN: RYDER, O A (ed). Rhinoceros biology and conservation..
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 68-81. San Diego: Zoological Society of San Diego.
CONSERVATION.

LIGGIT, B In quest of rhino.
Nyala, 5(2), 1979. 97-103.
CONSERVATION; MALAWI.

LOUW, L Privatization for preservation: obvious ways to save rhinos, elephants and ozone.
Insurance Portfolio, 29, 1989. 5-6.
TRADE.
Suggests the conservation of rhinos and elephants through the decriminalization of the trade in existing and potential rhino and elephant products..

LOUW, L Privatization for preservation: obvious ways to save rhinos, elephants and ozone.
MIRAFRA, 7(4), 1990. 96-99.
GAME FARMING.

*MACKIE,C IUCN project underway in Garamba, Zaire.
Pachyderm, 4, 1984. 17.
GARAMBA NATIONAL PARK.

MARTIN, E B They're killing off the rhino.
National Geographic Magazine, 165(3), 1984. 404-422.
CONSERVATION; POPULATIONS; DISTRIBUTION.

MARUSKA, E J DRESSER, B L Black rhino species survival plan - summary report.
Proceedings of the American Association of Zoological Parks and Aquariums, 1984, 1984. 307-308.
CONSERVATION; NORTH AMERICA; BREEDING; UNITED STATES.

*MCCULLOCH B ACHARD, P L Rhino reserve in Lake Victoria.
Oryx, 8 (3), 1965. 162-163.
LAKE VICTORIA.

MERZ, A From the brink of extinction.
1991. 212pp. Collins.
BOOKS.

MERZ, A Rhino at the brink of extinction.
1991. 220pp. Harper Collins.
BOOKS; POACHING.

MILLIKEN, T NOWELL, K THOMSEN, J B The decline of the black rhino in Zimbabwe: implications for future rhino conservation.
1993. i-iv, 1-76. Cambridge: TRAFFIC International.
CONSERVATION; POACHING; ZIMBABWE.

*MUNDY, P J Rhino workshop at Pilanesberg.
African Elephant and Rhino Group Newsletter, 3, 1984. 16-17.
PILANESBERG.

MUNN, A F Extinction is forever.
1990. Harare: Key Plan.
BOOKS.

MUNN, A F Extinction is forever; the Rhino girls' story.
1990. s.l.: Safari Connection.
BOOKS.

*NAYLOR, J N CAUGHLEY, G J ABEL, N O J LIBERG, O Luangwa Valley Conservation and Development Project. Report to UNDP/FAO.
1973. Rome: Mimeo.
LUANGWA VALLEY.

NORKIN, M (ED.) Black rhino found endangered.
Endangered Species Technical Bulletin, 5(8), 1980. 1.
CONSERVATION; US ENDANGERED SPECIES ACT 1973; UNITED STATES.

O'DONOGHUE, B Black rhino rescue.
1976. 115pp. Johannesburg: Perskor.
BOOKS.

OLIVER, I The white rhino.
Natal Wildlife, 24(8), 1983. 15.
CONSERVATION; MANAGEMENT; NATAL.

PARKER, I Wankie and the 'crisis carnival'.
Africana, 8(4), 1981. 25-26.
CONSERVATION; WANKIE GAME RESERVE.

PENZHORN, B L A summary of the re introduction of ungulates into South African national parks to 31 December 1970.
Koedoe, (14), 1971. 145-159.
NATIONAL PARKS; SOUTH AFRICA.

PITMAN, D Are we going to save the rhino or not?.
BBC Wildlife, 6(5), 1988. 266-267, 269, illus.
CONSERVATION.

PITMAN, D BURR, S (ILLUS) Rhinos; past, present and future?.
1991. Harare: Roblaw.
DESCRIPTION; BOOKS.

POWERS, S Land claims: Give me a home where the rhino don't roam.
Work in progress, 88, Apr 1993. 3.
AUGRABIES NATIONAL PARK.

RAUTENBACH, I L NEL, J A J ROOT, G A Mammals of Itala Nature Reserve, Natal.
Lammergeyer, 31, 1981. 21-37.
ITALA NATURE RESERVE.

REDMOND, I Sir Peter's paradox.
BBC Wildlife, February 1993. 42-44.
TRADITIONAL MEDICINE.
In 1961, when Sir Peter Scott predicted that the black rhino would be extinct in three decades, he was only about two thousand animals and two and a half years short of a bull's-eye. This article discusses the use of rhino horn in tradional medicine, CITES role in the protection of the rhino, and the various rhino conservation bodies in the world.

REECE, R W Rhinoceros SSP programs in North America: an overview. IN: RYDER, O A (Ed). Rhinoceros biology and conservation. Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 294-295. San Diego: Zoological Society of San Diego.
CONSERVATION; BREEDING; NORTH AMERICA; UNITED STATES.

RHINO AND ELEPHANT FOUNDATION The Rhino and Elephant Journal. 1988-. Johannesburg: Rhino and Elephant Foundation.
JOURNALS.

ROBINSON, S Save the rhino.
Wildlife, London, 23(9), 1981. 24-27.
CONSERVATION; POACHING; ECONOMICS; TRADE; ZAMBIA; LUANGWA VALLEY.

ROGERS, P The role played by the Natal Parks Board in the conservation of black and white rhino.
International Symposium on Wildlife Utilisation in Southern Africa; a veterinary perspective, 25 June-9 July 1994. (The Fourth Biennial International Wildlife Symposium for Veterinary Students), 1994. 25-27. Pretoria: SYMCO, Faculty of Veterinary Science, Onderstepoort.
NATAL PARKS BOARD.

RYDER, O A (ED) Rhinoceros biology and conservation.
Proceedings of an international conference. May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368, illus. (Papers indexed separately). San Diego: Zoological Society of San Diego.
CONSERVATION; DESCRIPTION.

SAS-ROLFES, M The economics of rhino extinction.
Endangered Wildlife, 2, June 1990. 4/9.
GAME FARMING; ECONOMICS.

*SAVORY, C A R Crisis in Rhodesia.
Oryx, 10(1), 1969. 25-30.
BEHAVIOUR; ZIMBABWE.

SIEBERHAGEN, S LLOYD, M Environment awareness: the Black Rhinocerous.
Environmental Education Bulletin, 2, Apr 1990. 18-19.
ENVIRONMENTAL EDUCATION.

SMITH, K SMITH, F Conserving rhinos in Garamba National Park. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 166-177, illus. San Diego: Zoological Society of San Diego.
GARAMBA NATIONAL PARK; POACHING.

*STEELE, N Operatie rhino.
Zoo Antwerpen, 35(1), 1969. 5-10.
STATUS.

STEWART, A Saving rhinos in Kenya.
IZN (International Zoo News), 37(3), 1990. 25-26, illus.
KENYA.

*STOKES, C S Sanctuary.
The Sanctuary Production Committee, 1941. 103-111.
BEHAVIOUR.

TATHAM, G The Rhino conservation strategy in the Zambezi valley code named operation Stronghold.
The Zimbabwe Science News, 22(1), Jan 1988. 21-23.
ZAMBEZI VALLEY; ZIMBABWE.

TATHAM, G H TAYLOR, R D The conservation and protection of the black rhinoceros Diceros bicornis-bicornis in Zimbabwe, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 31-42.
ZIMBABWE; POACHING.

*TAYLOR, R D The unsuccesful introduction of white rhinoceros to Matusadona National Park Kariba.
Pachyderm, 6, 1986. 14-15.
MATUSADONA NATIONAL PARK; BEHAVIOUR.

TUDGE, C Time to save rhinoceroses.
New Scientist, 131 (1788), 1991. 30-35.
CONSERVATION.

TURNER, E The white rhino; AAZPA-Species Survival Plan.
Proceedings of the American Association of Zoological Parks and Aquariums, 1984, 1984. 309-311.
CONSERVATION; NORTH AMERICA; UNITED STATES; BREEDING.

TURNER, E White rhino; a critical species.
Proceedings of the American Association of Zoological Parks and Aquariums, 1982, 1982. 31-35.
CONSERVATION; BREEDING.

VAN DER MERWE, C Spiking the guns.
Leadership, 8 (5), 1989. 83-95.
NAMIBIA; DEHORNING; POACHING.

VAN VLIET, K The survival of rhino in South Africa : fact or fiction?.
Natura, 23, Feb/Mar 1991. 4-6.
SOUTH AFRICA; ANAEMIA.

VINCENT, J GEDDES PAGE, J Back from the brink: the white rhino story. IN: MUNDY, P J (Ed). Proceedings of an International Symposium on the Extinction Alternative.
1984. 77-82, illus. Johannesburg, South Africa: Endangered Wildlife Trust.
NATAL.

VOGT, H H Nashornzucht in Bohmen.
Naturwissenschaftliche Rundschau, 45(3), 1992. 105-106, illus.
BREEDING; CZECHOSLOVAKIA.
German.

*WALKER, C Flight of the unicorn.
The Rhino and Elephant Foundation Journal, 1, 1988. 24-25.
DESCRIPTION.

WALKER, C Our turn next.
The Rhino and Elephant Journal, 9, June 1994. 6-10.
POACHING.
Guns and rhinos go together, and bold new initiatives are urgently needed.

WALKER, C The role of non-governmental organizations in black rhinoceros Diceros bicornis conservation in Africa, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 87-88.
FUNDING.

WEAVER, C CRYAN, J Rhino rescue.
1980?. National Film Library.
VIDEOS.
Videocassette (24 minutes); narrated by David Attenborough.

WESTERN, D Is the tide turning for elephants and rhinos?.
Pachyderm, 13, 1990. 25-29.
CONSERVATION.

CULTURE

BRENTJES, B The rhinoceros in old oriental and African cultures.
Säugetierkundliche Mitteilungen , 26(2), 1978. 150-160.
PAINTING.
The significance of rhinoceroses in old cultures of the Near-East and southern Asia are discussed. African rockpaintings of Rhinoceros unicornis are illustrated. Other rhinoceros species found are described. 281. German.

COLEMAN, K The Rhinoceros in the ancient world.
Lantern, 39(1), Feb 1990. 27-31.
PAINTING; DESCRIPTION.

SHARPE, S The black rhino.
Custos, 19(7), Oct 1990. 26.
POETRY.

DESCRIPTION

*ANON Comparative studies of the black and white rhinoceros.
African Wildlife, 7 (2), 1951. 124-127.
ECOLOGY.

ANON Endangered wildlife of the world; vol 7.
1993. 978-984. New York: Marshall Cavendish.
DESCRIPTION.

ANON Rupert.
Oryx, 7, 1963. 22-25.
DESCRIPTION.

ANON The black rhino (The big five).
Natura; wildlife magazine, 5, Jan/March 1985. 28-34.
DESCRIPTION.

*BABAULT, G Notes ethologiques sur quelqes mammiferes africains.
Mammalia, 13, 1949. 1-16.
BEHAVIOUR.

*BEST, A A *RAW, W G Rowland Ward's Records of big game, XVth ed (Africa).
1975. 537. London: Rowland Ward.

BEST, A A Rowland Wards Records of big game 15th edition Africa.
1971. 452.
HUNTING.

BEST, G A EDMOND BLANC, F RAW, W G Rowland Wards Records of big game.
1969. 438.
HUNTING.

BOOTH, M Rhino road; the black and white rhinos of Africa.
1992. London: Constable.
BOOKS; DESCRIPTION.

CADIEUX, C L Wildlife extinction.
1991. 259pp. Washington, D.C: Stone Wall Press.
DESCRIPTION.

CAVE, A J E ROOKMAAKER, L C Robert Jacob Gordons original account of the African black rhinoceros.
Journal of Zoology, 182(2), 1977. 137-156.
GORDON R J; AGE; MORPHOLOGY.
An account is presented of the memoranda and drawings comprising the description of the African Black rhinoceros prepared at the Cape of Good Hope South Africa in 1778 by Robert Jacob Gordon (1743-95) and now incorporated in the Gordon Atlas preserved in the Rijksmuseum Amsterdam, Netherlands. Gordon's rhinoceros information was placed at the disposal of contemporaries, whereby part of it entered zoological literature and occasioned the temporary recognition of a Gordon's rhinoceros. His material never attained independent publication and its historical and anatomical merit has thus escaped recognition. Impressive in standards of observation and delineation, it represents a pioneer investigation of African rhinoceros morphology. 311.

COOKE, H B S A critical review of the quaternaty Perissodactyla of southern Africa.
Annals of the South African Museum, 31, 1950. 393-479.
DESCRIPTION.

CURRY LINDAHL, K War and the white rhinos.
Oryx, 11(4), 1972. 263-267.
GARAMBA NATIONAL PARK.

*DORST, J DANDELOT, P A field guide to the larger mammals of Africa.
1970. 87. London: Collins.
MORPHOLOGY.

DORST, J DANDELOT, P A field guide to the larger mammals of Africa.
2nd ed 1972. 166-170. London: Collins.
DESCRIPTION.

*FOSTER, W E The square-lipped rhinoceros.
Lammergeyer, 1(1), 1960. 25-35.
BEHAVIOUR.

GODDARD, J The black rhinoceros.
Natural History, 82(4), 1973. 58-67.
BEHAVIOUR; MATING; SIGHT; SMELL; DIET; PROTECTION.

GROVES, C P Ceratotherium simum.
Mammalian Species, 8, 1972. 1-6.
DISTRIBUTION.

GRZIMEK, B Grzimek's Animal life encyclopedia, vol.13.
1972. 34-70. New York: Van Nostrand Reinhold.
DESCRIPTION.

*GUGGISBERG, C A W An appreciation of African rhinoceroses.
Animal Kingdom, 67, 1964. 115-121.
BEHAVIOUR; ECOLOGY.

HALL-MARTIN, A The nabab of Aukoerebis.
African Wildlife, 39(6), 1985. 244-247, illus.
DISTRIBUTION; AUGRABIES NATIONAL PARK.

HALTENORTH, T DILLER, H A field guide to the mammals of Africa including Madagascar.
1980. 115-119. London: Collins.
DESCRIPTION.

*HEPPES, J B The white rhinoceros in Uganda.
African Wildlife, 12(4), 1958. 272-280.
BEHAVIOUR; UGANDA.

HITCHINS, P M Field criteria for ageing immature black rhinoceroses Diceros bicornis size classes.
Lammergeyer, (12), 1970. 48-55.
AGE.

*IONIDES, C J P Nature notes (1): the northern white rhinoceros.
African Wildlife, 7(2), 1953. 127-135.
BEHAVIOUR.

JACKSON, P The future of elephants and rhinos in Africa.
Ambio, 11(4), 1982. 202-205.
POACHING; HABITAT.

KERR, M A FOTHERGILL, R Black rhinoceros in Rhodesia.
Oryx, 11(2-3), 1971. 129-134.
ZIMBABWE.

KING, J M In pursuit of the white rhinoceros.
African Wildlife, 16, 1962. 123.
DESCRIPTION.

LAWS, R M The Tsavo elephants.
Oryx, 11(1), 1971. 32-34.
TSAVO NATIONAL PARK.

*MICHA, M De witte neushoorn.
Zoo Antwerpen, 23(4), 1958. 111-115.
ZOOS.

NICOL, M Africana animals.
1982. 42-43, illus. Johannesburg: Brenthurst Press.
DESCRIPTION.

NOWAK, R M PARADISO, J L Walker's Mammals of the world, vol.2.
1983. 1165-1172. Baltimore: John Hopkins University Press.
DESCRIPTION.

OWEN SMITH, N The megaherbivore syndrome: alternative life style or different time frame?.
Perspectives in Vertebrate Science. 6, 1989. 441-457, illus.
EVOLUTION.

*PARSONS, J The natural history of the rhinoceros.
Philosophical Transactions of the Royal Society of London, 42, 1943. 1743
523-541.
DESCRIPTION.

*POTTER, H B Rhino as we know them.
African Wildlife, 3 (2), 1949. 128,137.
DESCRIPTION.

*RADINSKY, L B The families of the Rhinocerotidae (Mammalia, Perissodactyla).
Journal of Mammalogy, 47 (4), 1966. 631-639.
DESCRIPTION.

ROOKMAAKER, L C The mysterious "Liverpool rhinoceros".
Zoologische Garten, 63(4), August 1993. 246-258, illus.
DESCRIPTION; LIVERPOOL.

ROWE-ROWE, D T The ungulates of Natal.
1991. Pietermaritzburg: Natal Parks Board.
NATAL.

SANFORD, W R The African rhino.
1990. 48pp. Oxford: Heinemann.
BOOKS.

SKINNER, J D SMITHERS, R H N The mammals of the Southern African subregion.
1990. 567-575. Pretoria: University of Pretoria.
DESCRIPTION.
Order Perissodactyla, family Rhinocerotidae.

*SMITHERS, R H N The mammals of the southern African subregion.
1983. 736. Pretoria: University of Pretoria.
DESCRIPTION.

*STEINHARDT, J Vom wehrhaften Reisen und seinem Reich.
1920. 224. Hamburg Berlin Leipzig: Alster.
DESCRIPTION.

TORGERSEN, D A Elephant herds and rhino horns.
1981. 47pp. Chicago: Children's Press.
BOOKS.
Text and photographs feature the physical characteristics, territories, feeding habits and behaviour in the wild and in zoos of the world's largest land mammals, including rhinos..

*WATSON, J M The wild mammals of Teso and Karamoja.
Uganda Journal. 13(2), 1949. 182-201.
BEHAVIOUR; TESO; KARAMOJA.

WILSON, V J The large mammals of the Matopos National Park.
Arnoldia, 4 (13), 1969. 1-32.
MATOPOS NATIONAL PARK; DESCRIPTION.

*ZUKOWSKY, L Beitrag zur Kenntnis der Saugetiere der nordlichen Telle Deutsch-Sudwestafrikas unter besonderer Berucksichtigung des Grosswildes.
Archiv fur Naturgeschichte, 90(1), 1924. 29-164.
NAMIBIA.

*ZUKOWSKY,L Die Systematik der Gattung Diceros Gray, 1821.
Zoologische Garten, 30(1/2/3/4), 1965. 1-178.
DESCRIPTION.

*ZUKOWSKY,L Grossauger, die Hagenbeck entdeckte.
Zoologische Garten, 17(1/5), 1950. 211-221.
DESCRIPTION.

DIET

DIERENFELD, E S WARERU, F K DU TOIT, R BRETT, R A Alpha tocopherol alpha T levels in plants eaten by black rhinoceros Diceros bicornis. IN: 74th annual meeting of the Federation of American Societies for Experimental Biology, part II, Washington, D.C., USA, April 1-5, 1990.
Faseb (Federation of American Societies for Experimental Biology) Journal, 4(4), 1990. A1052.
LIPIDS; PLANTS.

GHEBREMESKEL, K WILLIAMS, G BRETT, R A BUREK, R HARBIGE, L S Nutrient composition of plants most favored by black rhinoceros Diceros bicornis in the wild.
Comparative Biochemistry and Physiology A Comparative Physiology, 98(3-4), 1991. 529-534.
PLANTS; NUTRIENTS.
The nutrient composition of plants that are most preferred by the black rhinoceros (Diceros bicornis) in Laikipia, Kenya, was studied. Mean zinc and selenium concentrations of the plants from Laikipia were higher than those of control (clover and rye, 1:1) material from the U. K. Except in Tinnea aethiopica, palmitic (16:0), linoleic (18:2n-6) and linolenic (18:3n-3) were the major fatty acids. The mean RRR-alpha-tocopherol content of the plants was 73.6 .mu.g/g DM, and 2.2 g/d were estimated to be consumed by free-living rhinoceros in the area. The results suggest that the quantitative vitamin E intake of supplemented captive black rhinoceros was comparable with that of their counterparts in the wild. The lack of any obvious relationship between plasma alpha-tocopherol and orally administered racemic alpha-tocopherol and its ester form in captive black rhinos may be due to an insufficiency of emulsifiers. 60.

GODDARD, J Food preferences of black rhinoceros Diceros bicornis in the Tsavo National Park.
East African Wildlife Journal, 8, 1970. 145-161.
TSAVO NATIONAL PARK; PLANTS.

*GODDARD, J Food preferences of two black rhinoceros populations.
East African Wildlife Journal, 6, 1968. 1-18.
PLANTS; ECOLOGY.

HALL MARTIN, A J ERASMUS, T BOTHA, B P Seasonal variation of diet and feces composition of black rhinoceros Diceros bicornis in the Addo Elephant National Park South Africa.
Koedoe, (25), 1982. 63-82.
DIET; PLANTS; FEEDING; FAECES.
The feeding habits of black rhinoceros were studied in the Addo Elephant National Park, Republic of South Africa, using the feeding track method and recording bites taken. A total sample of 59 feeding tracks, 5540 plants and 17, 191 bites were recorded from June, 1976-March, 1977. The rhino fed largely on woody shrubs but also took forbs, grass and succulent plants. During dry periods the rhino selected succulent plants with a high moisture content rather than woody plants. A total of 111 plant species were utilized. During dry months the feeding rate was greater than wet months. Physical analysis of feces composition confirmed conclusions drawn from observations. Chemical analyses of feces indicated that mean crude protein values varied with rainfall and herbage quality, ash values were strongly influenced by the intake of plant roots and dust during dry periods, acid detergent fiber was highest during unfavorable periods and low during favorable periods. 234.

*HITCHINS, P M Records of plants eaten by mammals in the Hluhluwe game reserve, Zululand.
Lammergeyer, 8, 1968. 31-39.
HLUHLUWE GAME RESERVE; PLANTS.

JARMAN, P J Diets of large mammals in the woodlands around Lake Kariba, Rhodesia.
Oecologia, 8(2), 1971. 157-178.
DIET; LAKE KARIBA; ZIMBABWE.
The feeding habits of 25 species of large mammals formerly living in the Kariba basin of the middle Zambezi Valley in Rhodesia, but forced to move to deciduous woodland areas since it was flooded, were studied from March 1964 to March 1967. The proportion of grass in the diets of most mammals studied was low, indicating that there were few grazers among the herbivores. Grazing mammals such as the hippopotamus and the waterbuck were rarely seen in the area studied. Most of the herbivores were browsers and only the tree components of their diets varied significantly between types of vegetation. The most common species such as the elephant, rhinoceros, impala, kudu and buffalo showed a seasonal variation in diet, but each depended on a small range of staple plants, which were different from those of other species. Diets overlapped during the wet season and in the late dry season. There was good correlation between the ability of a species to avoid overlap of diet and its presence in the study area..

"JARMAN, P J The composition of the recorded diet of rhinoceros throughout the year.
Oecologia, 8, 1971. 157-178.
PLANTS.

LOUTIT, B D LOUW, G N SEELY, M K First approximation of food preferences and the chemical composition of the diet of the desert dwelling black rhinoceros Diceros bicornis L..
Madoqua, 15(1), 1987. 35-54.
DESERT; NAMIBIA; PLANTS.
Food preferences of black rhino inhabiting an area of extreme aridity in Damaraland SWA/Namibia were examined using a transect survey method. A wide variety of plant species were browsed by rhino in this region. Of the 103 species of plants encountered, 74 were used and the selection indices showed a moderate degree of selectivity on the part of browsing rhino. The chemical composition of a selected number of plants favoured by rhino contained moderately high levels of soluble tannins but these chemical deterrents apparently had no effect on the feeding preferences of these animals. 158.

MASKALL, J E THORNTON, I The mineral status of Lake Nakuru National Park Kenya; a reconnaisance survey.
African Journal of Ecology, 27(3), 1989. 191-200.
LAKE NAKURU NATIONAL PARK; PLANTS; MINERALS.
The development of Lake Nakuru National Park as Kenya's rhinoceros sanctuary focused attention on the capacity of the area to supply adequate trace elements to wildlife. A reconnaissance survey has been carried out to establish the mineral status of soils and selected plant species and the results related to the health of animals. Soil and plant samples collected on a 1-km grid were analysed for twenty-five elements using Inductively Coupled Atomic Emission Spectrometry and blood samples analysed for copper and vitamin B12. The total concentrations of copper (Cu) and cobalt (Co) in soils were low, a geochemical feature shared by many Rift Valley soils derived from volcanic ash sediments and other volcanic rocks. Total soil selenium (Se) and phosphorus (P) levels were also relatively low. Grass species contained higher levels of copper and cobalt and lower levels of selenium compared to the browse plants. Molybdenum (Mo) levels in all plants reached relatively high values and availability of this element appeared to increase in wetter soils of high pH near the lakeshore. Over 30% of impala sampled had a blood copper level below that regarded as normal for domestic animals. The relatively high molybdenum content of grasses and browse plants is believed to contribute to possible copper deficiencies in impala and waterback in the park. Lack of data on the mineral requirements of other wildlife species prevents assessment of the risk of deficiencies to these species at the present time. 122.

SPALA, P HRADECKY, P Preliminary determination of nutritional requirements of the pregnant black rhinoceros (Diceros bicornis). IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 277-281, illus. San Diego: Zoological Society of San Diego.
NUTRITION; ZOOS; PREGNANCY; REPRODUCTION.

DISEASES

BAMBIR, S KARDUM, P CURIC, S Calcinosis of the endocardium in a black rhinoceros (Verkalkungen am Endokard bei einem Spitzmaulnashorn (Diceros bicornis), IN: IPPEN, R and SCHRODER, HD (Eds). Erkrankungen der Zootiere. Verhandlungsbericht des Internationalen Symposiums, 27, 1985. 423-424.
CARDIOVASCULAR SYSTEM; CARDIOVASCULAR DISEASES; CALCINOSIS.
German Summaries in English, French, Russian.

#BEGG, T B Hemoglobinuria in the black rhino.
British Veterinary Zoological Society Newsletter and Summaries of Papers, 1981. 3.
HAEMOGLOBINURIA.

BIGALKE, R D The current status of research on diseases of wildlife in South Africa and South West Africa-Namibia.
Journal of the South African Veterinary Association, 60(1), 1989. 7-10.
ECOLOGY; MANAGEMENT; GENETIC DISEASE RESISTANCE; SOUTH AFRICA; NAMIBIA; HABITAT.

BOEVER, W J Interdigital corns in a black rhinoceros.
Veterinary Medicine and Small Animal Clinician, 71(6), 1976. 827-830; 5 ref.
SURGERY; FOOT DISEASES; ETORPHINE.

BOTHMA, J DU P VAN ROOYEN, N Wild, IN: BOTHMA, J DU P (ed). Wildplaasbestuur.
1986. 116-117. Pretoria: Van Schaik.
DISEASES.

CHAPLIN, H JR MALECEK, A C MILLER, R E BELL, C E GRAY, L S HUNTER, V L Acute intravascular hemolytic anemia in the black rhinoceros; hematologic and immunohematologic observations.
American Journal of Veterinary Research, 47(6), 1986. 1313-1320.
ANAEMIA; HAEMATOLOGY.
To investigate the syndrome of acute intravascular hemolytic anemia in the black rhinoceros (Diceros bicornis), laboratory techniques used in the differential diagnosis of hemolytic anemias were performed on blood samples from 6 black rhinoceroses: 3 nonrelated healthy rhinoceroses, 1 rhinoceros with iron deficiency anemia, and 2 rhinoceroses with intravascular hemolysis. Osmotic fragility, erythrocyte membrane protein composition, hemoglobin electrophoresis, and hemoglobin stability did not distinguish between healthy and affected (anemia or hemolysis) rhinoceroses. Polyclonal antiglobulin reagents were prepared in rabbits, using whole rhinoceros serum and purified rhinoceros immunoglobulin G. These reagents were nonreactive against erythrocytes of the healthy and iron-deficient rhinoceroses. Reactions with RBC from the rhinoceros with fatal hemolytic anemia indicated increased membrane coating by the third component of complement; this was not evident in a second rhinoceros that survived a hemolytic event. 189.

DE VOS, V Death due to volvulus in a white rhinoceros Ceratotherium simum from the Kruger National Park.
Koedoe, (18), 1975. 199-202.
VOLVULUS; INTESTINAL DISEASES.
Acute intestinal obstruction due to volvulus is described as the cause of death in an adult white rhinoceros cow. It is also pointed out that the gross anatomical features which predispose volvulus in the horse, are also present in the white rhinoceros and is considered to have some significance in the etiology of the present case. 321.

DE VOS, V Volvulus in a white rhinoceros, Ceratotherium simum (correspondence).
Journal of the South African Veterinary Association, 46(4), 1975. 374.
VOLVULUS; INTESTINAL DISEASES; TORSION.
English, Afrikaans.

DOUGLASS, E M Hemolytic anemia in two black rhinos.
Annual Proceedings of the American Association of Zoo Veterinarians, 1979 (UNDATED ?1979). 116-117.
PARASITES; DISEASES; ANAEMIA; LEPTOSPIROSIS.

DOUGLASS, E M PLUE, R E Hemolytic anemia suggestive of leptospirosis in the black rhinoceros Diceros bicornis.
Journal of the American Veterinary Medical Association, 177(9), 1980. 921-923.
LEPTOSPIROSIS; ANAEMIA.

DUFAIT, R Presence of Malassezia Pachydermatis Synonym Pityrosporum Canis Anis on the hairs and feathers of domestic animals. IN: Meeting of the Societe Francaise de Mycologie Medicale (French Society for Medical Mycology), Paris, France, Nov. 23-24, 1984.
Bulletin de la Societe Francaise de Mycologie Medicale, 14(1), 1985. 19-22.
MALASSEZIA PACHYDERMATIS.
French.

#FIENNES, R N T-W Report of the Society's pathologist for the year (mitral stenosis, bronchitis in a black rhinoceros).
Journal of Zoology, 148, 1966. 372.
PATHOLOGY; ZOOS.

FURLEY, C The management, behavior and health of rhinos at Port Lympne. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an International Conference, May 9-11, 1991, San Diego, California, USA, 1992, 1993. 299-301. San Diego: Zoological Society of San Diego.
DISEASES; ZOOS; UNITED STATES.

GEMEINHARDT, H IPPEN, R Pulmonary mycosis in two black rhinoceroses (Diceros bicornis) through mixed Aspergillus fumigatus and Absidia corymbifera (ramosa) infection (Lungenmykose beim Spitzmaulnashorn (Diceros bicornis) durch Mischinfektion von Aspergillus fumigatus und Absidia corymbifera (ramosa). (Bericht uber 2 Falle).
Zoologische Garten, 52(5/6), 1982. 342-350; 16 ref.
ASPERGILLUS FUMIGATUS; ABSIDIA CORYMBIFERA; RESPIRATORY DISEASES; MYCOSES.
Two adult black rhinoceroses died suddenly within 6 months at the Berlin zoo. The lungs of the two animals contained numerous nodules, which yielded both Aspergillus fumigatus and Absidia corymbifera.. German Democratic Republic. German.

#GILLESPIE, D BURTON, M KOHN, C GOSSELIN, S MUNSON, L An unusual case of ulcerative stomatitis and prolonged pregnancy in a black rhinoceros.
Proceedings of the American Association of Zoo Veterinarians, 1990, 1990. 319-321.
STOMATITIS; PREGNANCY.

GOLTENBOTH, R KLOS, H G Myoglobinuria in zebra and other diseases in mammals at the Berlin Zoo. (Myoglobinurie bei Zebras und einige andere Erkrankungen bei Saugetieren des Zoologischen Gartens Berlin). IN: Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 4-8 Juni 1975, Tunis, 17, 1975. 211-216. Berlin, German Democratic Republic: Akademie Verlag.
GERMANY; ZOOS.
German Summaries in English, French, Russian.

*HITCHINS, P M Black rhino: infant mortality.
Natal Parks Board Zoological Report, 80, 1970. 3.
MORTALITY; CALF.

IPPEN, R SCHRODER, H D (EDS) Diseases of zoo animals.
Proceedings of the 29th International Symposium of Diseases of Zoo Animals held on 20-24 May 1987 in Cardiff, UK. (Erkrankungen der Zootiere. Verhandlungen der Zootiere vom 20. Mai bis 24. Mai 1987 in Cardiff), 369pp.; ISSN 0138-5003., 1987. DDR-1086 Berlin, German Democratic Republic: Akademie Verlag.
ZOOS.
These proceedings contain 56 papers presented by contributors from 15 countries. The first 18 papers cover diseases of birds, particularly water fowl. The remainder cover a wide range, some grouped by topic or species. For example, there are two papers on xylazine immobilization of zoo animals, followed by four papers about the elephant (epidural anaesthesia, wound healing, treatment of hoof cancer, and herpesvirus infection) and two on the rhinoceros..

#JAROFKE, D KLOS,H G Erkrankung bei in Gefangenschaft gehaltenen afrikanischen Nashornen (Zuchtbuchhauswertung) (Diseases of captive African rhinoceroses), IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 14, 1979. 287-289.
ZOOS.

JAROFKE, D KLOS, H G Successful treatment of myoglobinuria in a black rhinoceros (Diceros bicornis) in the Berlin zoo (Erfolgreiche Behandlung einer Myoglobinurie bei einem Spitzmaulnashorn (Diceros bicornis) im Zoo Berlin). IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 1988, Sofia, 30, 1988. 385-388; 24 ref. Berlin, German Democratic Republic: Akademie Verlag.
MYOGLOBINURIA; ZOOS; VETERINARY MEDICINE AND SURGERY.
German Summaries in English, French, Russian.

JAROFKE, D KLOS, H G FRESE, R Zuchtbuchauswertung der Todesursachen von Spitzmaulnashornern (Diceros bicornis L.) in Zoologischen Garten, in: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 33, 1991. 333-336, illus.
ZOOS; MORTALITY.
German Summaries in English; French; Russian.

JAROFKE, D FRESE, R Zuchtbuchauswertung der Todesursachen von Breitmaulnashornern (Ceratotherium simum) in Zoologischen Garten, IN: IPPEN, R and SCHRÖDER, H D (Eds). Erkrankungen der Zootiere. Verhandlungsbericht des Internationalen Symposiums, 34, 1992. 281-286, illus.
MORTALITY; PARASITES; ZOOS.
German Summaries in English; French.

JESSUP, D A KOCK, M D MORKEL, P Health data gained from black rhino immobilized for relocation. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 311-314. San Diego: Zoological Society of San Diego.
PARASITES; DISEASES.

KLOS, H G LANG, E M SPECKMAN, G (TRANSLATOR) Handbook of zoo medicine. Diseases and treatment of wild animals in zoos, game parks, circuses and private collections (Translation from German into English).
1982. xvii + 453pp.; many ref., 108 fig. New York, USA: Van Nostrand Reinhold Co.
ZOOS.

KLUG, E MARTIN, J C SOBERON, E GUNZEL, A R GRASER, A DELLBRUGGE, K MACHADO C Cauloplegia with partial prolonged erection and necrotic preputial prolapse in a rhinoceros (Ceratotherium simum) (Penislahmung mit partieller Dauererektion und nekrotisierendem Praputialprolaps bei einem Breitmaulnashorn (Ceratotherium simum).
Blauen Hefte fur den Tierarzt, 58, 1978. 400-404; 12 ref.
PENIS; GENITAL DISEASES.
German.

KOCK, N FOGGIN, C KOCK, M TREMBATH, P JESSUP, D Coronary artery aneurysms in two black rhinoceroses (Diceros bicornis) in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 22(3), 1991. 355-358; 6 ref.
CARDIOVASCULAR DISEASES.

KOCK, N FOGGIN, C KOCK, M D KOCK, R Hemosiderosis in the black rhinoceros (Diceros bicornis) in Zimbabwe; a comparison of free-ranging and recently captured with translocated and captive animals.
Journal of Zoo and Wildlife Medicine, 23 (2), 1992. 230-234.
HEMOSIDEROSIS.

KULOW, W Diseases of rhinoceros seen by a zoo veterinarian, and immobilisation of rhinoceros by drugs (Krankheiten der Nashorner aus der Sicht des Zootierarztes mit einem Beitrag zur medikamentellen Immobilisierung).
1990. 252 pp.; 47 pp. of ref. Inaugural-Dissertation. Berlin, Germany: Fachbereich Veterinarmedizin, Freie Universitat.
THESES; ZOOS; IMMOBILISATION/DRUGS; DRUGS.
German Summary in English.

KUTTIN, E S KAPLAN, W SCHOLER, H I BURTSCHER, H KOEHLER, H Sexual and asexual reproduction of aspergillus-nidulans in vivo.
Mykosen, 28(3), 1985. 109-116.
RESPIRATORY DISEASES; ASPERGILLUS.
Both the sexual and asexual fruiting bodies of A. nidulans were discovered in the lung tissue of a captive rhinoceros, in a biopsy specimen from a human with bronchial stump aspergillosis, and in the guttural pouch of a horse. A zygomycete with unusual morphology was found in the lungs of the rhinoceros. 206.

#LYON, D G Report on muscular dystrophy of a 2 year old black rhinoceros.
Annual report of the laboratory of the North of England Zoological Society, 1975. Zoological Society of the North of England.
MUSCULAR DYSTROPHY.

*MCCULLOCH, B ACHARD, P L Mortalities of black rhino.
International Zoo Yearbook, 9, 1969. 139-142.
MORTALITY.

MELTZER, D G A Diseases in free-ranging black and white rhinoceroses.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 176-179 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
DISEASES.

#MESSOW, C Filarien-dermatitis beim Nashorn (Filarial dermatitis in a rhinoceros), IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 9, 1967. 195-196.
DERMATITIS; SKIN DISEASES; PARASITES.

MICHALSKA, Z GUCWINSKI, A [Intramural haematomas of the small intestine as the cause of death of a rhinoceros (Diceros bicornis)] (Krwiaki srodscienne jelita cienkiego przyczyna smierci nosorozca zwyczajnego (Diceros bicornis).
Medycyna Weterynaryjna, 30(2), 1974. 107-108.
INTESTINAL DISEASES; HAEMATOMAS.
Polish Summaries in English, Russian.

MIHOK, S MUNYOKI, E BRETT, R A JONYO, J F ROTTCHER, D MAJWA, P A O KANGETHE, E K KABURIA, H F A ZWEYGARTH, E Trypanosomiasis and the conservation of black rhinoceros Diceros bicornis at the Ngulia Rhino Sanctuary Tsavo West National Park Kenya.
African Journal of Ecology, 30(2), 1992. 103-115.
TRYPANOSOMIASIS; NGULIA RHINO SANCTUARY.
Tsetse populations and trypanosome infections were monitored at the Ngulia Rhino Sanctuary to assess the impact of trypanosomiasis on rhinoceros. High densities of Glossina pallidipes were found near a permanent spring by the Ngulia escarpment; G. longipennis and G. brevipalpis were also present in lower numbers. Infection rates in G. pallidipes averaged 3.6 %, with three times as many T. vivax as T. congolense infections. T. simiae and T. brucei were present at low frequency. DNA probes revealed that all mature T. congolense infections belonged to the Savanna subgroup. G. pallidipes fed on many hosts, with most meals taken from bovids and elephants. Rhino account for one of the blood meals in a small sample taken from G. longipennis. During a time of low tsetse densities (dry season), we estimated that the wild host population was acquiring seven infections per km2 per day. At lower levels of challenge, an experimental rhino became infected with T. congolense. These results are discussed in terms of future plants for the repopulation of rhino in tsetse-infested areas in Kenya. 22.

MILLER, R D Health concerns and veterinary research in the North American black rhinoceros (Diceros bicornis) population. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 302-306. San Diego: Zoological Society of San Diego.
PARASITES; DISEASES; NORTH AMERICA; UNITED STATES.

MILLER, R E Diseases of black rhinoceroses in captivity.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 180-185 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
DISEASES; ZOOS.

MILLER, R E CAMBRE, R C DE LAHUNTA, A BRANNIAN, R E SPRAKER, T R JOHNSON, C BOEVER W J Encephalomalacia in three black rhinoceroses (Diceros bicornis).
Journal of Zoo and Wildlife Medicine, 21(2). 1990. 192-199, illus.
ENCEPHALOMALACIA; BRAIN.

MILLER, R E CAMBRE, R DELAHUNTA, A BOEVER, W J Encephalopathy in two black rhinoceros (Diceros bicornis) calves.
Proceedings of the First International Conference on Zoological and Avian Medicine, 1987. 467. Association of Avian Veterinarians & American Association of Zoo Veterinarians.
ENCEPHALOPATHY; BRAIN.

MILLER, R E BOEVER, W J Fatal hemolytic anemia in the black rhinoceros: case report and a survey.
Journal of the American Veterinary Medical Association, 181(11), 1982. 1228-1231; 15 ref.
ANAEMIA.

MILLER, R E Hemolytic anemia in the black rhinoceros.
Zoo and wild animal medicine; current therapy 3, ed.by M.E.Fowler, 1993. 455-458. Philadelphia: W B Saunders.
ANAEMIA.

MILLER, R E Hemolytic anemia in the black rhinoceros (Diceros bicornis).
Pachyderm, 9, 1987. 26-28.
ANAEMIA.

MILLER, R E CHAPLIN, H PAGLIA, D E BOEVER, W J Hemolytic anemia in the black rhinoceros - an update.
Proceedings of the American Association of Zoo Veterinarians, 7-8; 5 ref., 1986.
ZOOS; ANAEMIA.

MILLER, R E BOEVER, W J Hemolytic anemia in the black rhinoceros (Diceros bicornis). IN: Fowler, M E (Ed)..
Proceedings of the American Association of Zoo Veterinarians, Tampa, Florida, October 24-27, 1983, 1983. 51-53; 11 ref.
ZOOS; ANAEMIA.

MONTALI, R J MANN, P C JONES, D M GRINER, L A KUEN, G R NARUSHIMA, E BUSH, M Leiomyomas in the genital tract of large zoo mammals (elephant and rhinoceros). IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 19-23 Mai 1982, Veszprem, 24, 1982. 117-122; 5 ref. 1086 Berlin, German Democratic Republic: Akademie Verlag.
GENITAL DISEASES; GENITAL TRACT.
English Summaries in German, French, Russian.

MUNSON, L Mucosal and cutaneous ulcerative syndrome in black rhinoceros (Diceros bicornis). IN: RYDER, O A (Ed) Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 354-356. San Diego: Zoological Society of San Diego.
PARASITES; DISEASES; ZOOS.

MUNSON, L MILLER, R E Oral and skin ulcers in black rhinoceroses (Diceros bicornis).
Journal of the American Veterinary Medical Association, (in press) 1994?.
SKIN DISEASES; ULCERS.

NELSON, L Rhinocerotidae.
Zoo and wild animal medicine, 1978. 763-768. Philadelphia: W B Saunders.
BREEDING; CAPTIVE CARE.

#OTT, J E MCDONALD, S E ROBINSON, P T WRIGHT, F W Ulcerative stomatitis in a black rhinoceros (Diceros bicornis).
Proceedings of the American Association of Zoo Veterinarians, 1982. 68-71.
STOMATITIS.

PAGLIA, D Haemolytic anaemia; potential therapeutic and preventative strategies.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 196-198 Pretoria: South African Veterinary Association Wildlife Group, University of Pretoria.
ANAEMIA.

#PAGLIA, D E MILLER, R E Increased susceptibility of black rhinoceros (Diceros bicornis) red blood cells to oxidant stress and consequent hemolysis.
AAZPA (American Association of Zoological Parks and Aquariums) Communique, April, 1992. 7.
HAEMATOLOGY; HAEMOLYSIS.

RAMSAY, E C ZAINUDDIN, Z-Z Infectious diseases of the rhinoceros and tapir.
Zoo and wild animal medicine; current therapy 3, ed. by M. E. Fowler, 1993. 459-466. Philadelphia: W B Saunders.
DISEASES.

#RUBEL, A Erkrankung von Spitzmaulnashornern im Zuricher Zoo (Diseases of black rhinoceroses at the Zurich Zoo).
VAZ, 10, 1990.
SWITZERLAND; ZOOS.

SCHNEIDER, H E WISSER, J Pericarditis sicca in a female wide-mouthed rhinoceros. (Pericarditis sicca bei einem weiblichen Breitmaulnashorn (Ceratotherium simum). IN: Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 29, 1987. 185-188; 1 ref.
PERICARDITIS; CARDIOVASCULAR DISEASES; PATHOLOGY.
German Summaries in English, French, Russian.

*SCHULZ, K C A *KLUGE, E B Dermatitis in the black rhinoceros (Diceros bicornis) due to filariasis.
Journal of the South African Veterinary Medical Association, 31(2), 1960. 265-269.
DERMATITIS; SKIN.

SILBERMAN, M S FULTON, R B Medical problems of captive and wild rhinoceros-a review of the literature and personal experiences.
Journal of Zoo Animal Medicine, 10(1), 1979. 6-16; 115 ref.
ZOOS; RESTRAINT; VETERINARY MEDICINE AND SURGERY; PARASITES.
A review of the diseases, parasites, husbandry, and restraint of the Rhinocerotidae..

#TAKAHASHI, H An autopsy case of black rhinoceros which showed anemia and hemoglobinuria.
Journal of the Japanese Association of Zoological Gardens and Aquariums, 1962. 106-107.
HAEMOGLOBINURIA; PATHOLOGY; ANAEMIA.

#THOMSON, J K PRIESTLY, F W Enteritis of a white rhinoceros associated with Pseudomonas pyocyanea infection.
Veterinary Record, 61, 1949. 341.
ENTERITIS.

VELLAYAN, S ZAHEDI, M JEFFERY, J Gastric myiasi due to Gyrostigma pavesii diptera gastrophilidae in a white rhinoceros Ceratotherium simum.
Malaysian Veterinary Journal, 7(4), 1983. 241-244.
GASTRIC MYIASIS; FLIES.
A case of gastric myiasis in a white rhinoceros, (C. simum), due to an African botfly, G. pavesii, at the Zoo Negara Malaysia, is presented. A total of 30 live 3rd-stage larvae were recovered at postmortem from the animal which died due to a condition unrelated to myiasis. The effect of modern transportation and indiscriminate importation of animals from foreign countries on human and animal health is discussed. 204.

#WALLACH, J D Degenerative arthritis in a black rhinoceros.
Journal of the American Veterinary Medical Association, 151, 1967. 887-889.
ARTHRITIS.

WALLACH, J D BOEVER, W J Perissodactyla (equids, tapirs, rhinos), Proboscidae (elephants), and Hippopotamidae (hippopotamus).
Diseases of exotic animals, 1983. 761-829; 233 ref., 78 fig. Philadelphia, USA: W B Saunders.
DISEASES.

WALTER, J H KIRCHHOFF, A SCHAUER, G GOLTENBOTH, R Globulare periodontale Zementdysplasien bei einem Spitzmaulnashorn (Diceros bicornis).
Berliner und Munchener Tierarztliche Wochenschrift, 105(9), 1992. 311-314, illus.
TEETH.
German Summary in English.

DISTRIBUTION

ANSELL, W F H Black rhinos.
International Fieldsports & Conservation, 1992(January-February), 1992. 52.
ZAMBIA.
Distributional record correction and possible former status, note.

*ATTWELL, L The Natal game reserves.
African Wildlife, 1(2), 1947. 24-29.
NATAL.

*ATTWELL, R I G Last strongholds of rhinoceros.
African Wildlife, 2 (3), 1948. 34-52.
DISTRIBUTION.

*BARNARD, M K The Kaokoveld-expedition, some interesting observations.
African Wildlife, 6(1), 1952. 76-79.
KAOKOVELD; DISTRIBUTION.

*BIGALKE, R The adulteration of the fauna and flora of our national parks.
South African Journal of Science, 43, 1947. 221-225.
SOUTH AFRICA; DISTRIBUTION.

*BORNER, M Selous aerial survey 1981.
African Elephant and Rhino Group Newsletter, 1, 1983. 7.
SELOUS; ECOLOGY; CENSUSING.

*BRAND, D J Distribution and numerical status of the southern white rhinoceros (Ceratotherium simum Burchell) and the black rhinoceros (Diceros bicornis Linnaeus) in southern Africa.
Zoon, 2, 1964. 1-3.
SOUTH AFRICA; STATUS.

*BRAND, D J Verbreitung und zahlenmässige Aufiellung der südlichen weissen Nashorns (Diceros simus Burchell) und des schwarzen Nashorns (Diceros bicornis Linnaeus) in Südafrika.
Freunde des Kölner Zoo, 7(2), 1964. 67-69.
SOUTH AFRICA; STATUS.

BRITZ, M LOUTIT, B C Monitoring and identification of black rhinoceros Diceros bicornis in Damaraland Namibia and the compilation of a population registerIN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park South Africa, August 31-September 4, 1988..
KOEDOE, 32(2), 1989. 61-64.
POPULATIONS; DAMARALAND; CENSUSING.

*CHILD, G Report to the Government of Botswana on an ecological survey of northeastern Botswana No TA 2563.
1968. 58-59. Rome: Food and Agriculture Organization of the United Nations.
DISTRIBUTION; BOTSWANA.

*CHILD, G SAVORY, C R The distribution of large mammal species in southern Rhodesia.
Arnoldia, 1(4), 1964. 1-15.
ZIMBABWE; TRANSLOCATION.

*COBB, S The distribution and abundance of the large herbivore community of Tsavo National Park, Kenya.
1976. 68. Ph.D. thesis.
TSAVO NATIONAL PARK; THESES; DISTRIBUTION.

*COWLES, R B Zulu journal: field notes of a naturalist in South Africa.
1959. Berkeley/Los Angeles: University of California Press.
DISTRIBUTION.

*CUMMING, D H M Chairman's Report.
Pachyderm, 7, 1986. 1-3.
DISTRIBUTION; POACHING; STATUS.

*DIXON, J E W Notes on the mammals of the Ndumu game reserve.
Lammergeyer, 6, 1966. 24-40.
NDUMU GAME RESERVE; DISTRIBUTION.

*DIXON, J E W Preliminary notes on the mammal fauna of the Mkuzi Game Reserve.
Lammergeyer, 3(1), 1964. 40-58.
MKUZI GAME RESERVE; DISTRIBUTION.

*DOUGLAS-HAMILTON, I HILLMAN, A K K HOLT, P ANSELL, P Luangwa Valley Elephant, Rhino and Wildlife Survey. Report to the IUCN/WWF/NYZS.
1979. Nairobi:
LUANGWA VALLEY; ECOLOGY.

*DOWSETT, R J Luangwa Valley mammal notes.
The Puku, 5, 1969. 220-222.
LUANGWA VALLEY; DISTRIBUTION.

DU TOIT, R F Distribution and monitoring of black rhinoceros Diceros bicornis populations in Zimbabwe. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 83.
POPULATIONS; ZIMBABWE; CENSUSING; MONITORING.

*GAERDES, F Nashörner in Südwestafrika.
Mitteilungen der S.W.A. wissenschaftliche Gesellschaft, 8(3/4; 5), 1967. 1-8; 9-15.
DISTRIBUTION; NAMIBIA; ECOLOGY.

*HAEZAERT, J The black rhinoceros is brought back to Ruanda.
Oryx, 5(3), 1959. 96-99.
RUANDA; TRANSLOCATION.

*HERBERT, H J AUSTEN, B The past and present distribution of the black and square lipped rhinoceros in the Wankie National Park.
Arnoldia, 5(26), 1972. 1-6.
DISTRIBUTION; WANKIE NATIONAL PARK; TRANSLOCATION.

*HILLMAN, A K K Past and present estimates of rhinoceros numbers in Kenya. Report for IUCN African Rhino Group Elephant Survey and Conservation Programme and the Kenya Rhino Action Group.
1979.
DISTRIBUTION; KENYA; STATUS.

HILLMAN, K Rhinos in Africa now.
Swara, 3 (10), 1980. 22-24.
DISTRIBUTION.

*HITCHINS, P M The black rhinoceros in South Africa.
Endangered Wildlife, 1 (2), 1975. 2.
SOUTH AFRICA.

HOWARD, P C The distribution and status of some large mammals on private land in Natal.
Lammergeyer, 34, 1984. 1-58.
NATAL; STATUS.

JOUBERT, E The past and present distribution and status of the black rhinoceros Diceros bicornis in South-West Africa.
Madoqua, 1(4), 1971. 33-43.
STATUS; NAMIBIA.

*KLUGE, E The white rhinoceros of the Umfolozi game reserve.
African Wildlife, 4 (2), 1950. 154-159.
UMFOLOZI GAME RESERVE.

*LANCASTER, D G A check list of the mammals of Northern Rhodesia: vii. 1953. 56pp. Lusaka: Government Printer.
ZAMBIA.

*LEADER-WILLIAMS, N Black rhino in South Luangwa National Park.
Oryx, 19 (1), 1985. 27-33.
LUANGWA NATIONAL PARK; POACHING.

*LOWNDS, L Mammals of the Kruger National Park.
African Wildlife, 6 (1), 1952. 50-54.
KRUGER NATIONAL PARK.

*MENTIS, M T Distribution of some wild animals in Natal.
Lammergeyer, 20, 1974. 1-68.
NATAL.

*RIPLEY, S D Comments on the black and square-lipped rhinoceros species in Africa.
Ecology, 39 (1), 1958. 172-174.
ECOLOGY.

*ROTH, H H White and black rhinoceros in Rhodesia.
Oryx, 9 (3), 1967. 217-231.
ZIMBABWE.

*STELFOX, J *KUFWAFWA, J Distributions, densities and trends of elephants and rhinoceros in Kenya, 1977-1978, from Kenya Rangeland Ecological Monitoring Unit Aerial Surveys.
1979. Nairobi: Mimeo.
DISTRIBUTION; BEHAVIOUR; KENYA; ECOLOGY; POPULATIONS.

*THOMSON, W R Factors affecting the distribution and survival of black rhinoceros (diceros bicornis L) in Rhodesia.
Certificate in field ecology, 1971. University of Rhodesia.
DISTRIBUTION; BEHAVIOUR; ZIMBABWE.

VAN LAVIEREN, L P ESSER, J D Numbers distribution and habitat preference of large mammals in Bouba Ndjida National Park Cameroon.
African Journal of Ecology, 18(2-3), 1980. 141-154.
POPULATIONS; HABITAT; CENSUSING; BOUBA NDJIDA NATIONAL PARK; CAMEROON.
An aerial census of the large mammal populations Diceros bicornis, Loxodonta africana, Phacochoerus aethiopicus, Giraffa camelopardalis, Taurotragus derbianus, Hippotragus equinus, Kobus ellipsiprymnus unctuosus, Redunca redunca, Alcelaphus buselaphus, Damaliscus lunatus korrigum, Sylvicapra grimmia, Ourebia ourebi and Syncerus caffer of the Bouba Ndjida National Park, Cameroon was carried out, using systematic transect sampling. The park area was divided into 6 blocks with 2 in the high density stratum and 4 in the low density stratum. Total population estimates of the most abundant species were compared with results of previous ground counts. Accuracy and precision of the estimates and applicability of light aircraft in these types of habitat are discussed. The locality of all recorded animals was plotted on a 1:100,000 vegetation map for preparation of distribution maps. Relative habitat preferences were calculated for four major vegetation types. Results are discussed and costs evaluated. 269.

*VINCENT, J The distribution of ungulates in Natal.
Annals of the Cape Province Museums, 2, 1962. 110-117.
DISTRIBUTION; NATAL.

WILLIAMS, N L Black rhino in South Luangwa National Park: their distribution and future protection.
Oryx, 19(1), 1985. 27-33, illus.
LUANGWA NATIONAL PARK; POPULATIONS.

ECOLOGY

ANON A Mary celebration.
Brookfield Bison, 1978-1979(DEC/JAN), 1979. 6-7.
LIFE CYCLE.

*ANON Elephant kills rhino.
Safari, 7, 1979.
ELEPHANT; BEHAVIOUR.

*ATTWELL, R I G Oxpeckers and their associations with mammals in Zambia.
The Puku, 4, 1966. 17-48.
OXPECKERS; ECOLOGY; ZAMBIA.

BANZIGER, H Skin piercing blood sucking moths I: ecological and ethological studies on Calpe eustrigata (Lepid., Noctuidae).
Acta Tropica, 32(2), 1975. 125-144; 23 ref., 13 fig.
MOTHS; BLOOD SUCKING.
The biology of the only known skin piercing, blood sucking moth, Calpe eustrigata Hmps. [cf. RAE/B 61, 837, etc.], was studied from May 1971 to May 1973. It was present in 2 climatic regions, the constantly wet tropics in Malaysia and southern Thailand and the tropical monsoon region in western and northern Thailand and northern Laos. It occurred only in or near forests (mainly evergreen dipterocarp rain forest) up to an altitude of 350 m and was active from 8 p.m. to 2 a.m., and mainly from 10 p.m. to midnight. Hairless scars, excoriations, fissures in the skin, and fresh or old sores with or without tissue fluids or blood were often but not always preferred to healthy skin. However, in order to suck blood, the moth always pierced the tissue, even if blood was freely present at the wound. The average feeding time was 12 min and the maximum 30 min. Piercing was observed on Malayan tapir, black rhinoceros, Indian elephant, sambar deer, nilgai antelope and water buffalo, Zebu cattle, red deer and fallow deer were pursued unsuccessfully, probably because of their restless habits. There was no definite evidence of feeding on man. Despite regular checks, C. eustrigata was never observed in the open feeding on mammalian eye-secretions, saliva, urine or dung or on fresh or stale fish or meat with or without blood, or on bruised fruit or vegetables, nectar of flowers or fruit on trees; caged moths pierced a variety of fruits. All the moths seen were males. It is suggested that the females are phytophagous. Ethological and ecological features indicate that the feeding habits of C. eustrigata are a rather recent development, probably derived from nectar sucking through fruit piercing..

BANZIGER, H The heaviest tear drinkers: ecology and systematics of new and unusual notodontid moths.
Natural History Bulletin of the Siam Society, 36(1), 1988. 17-53; 42 ref.
LEPIDOPTERA; MOTHS; TEAR DRINKING; ECOLOGY; HOSTS.
Seven moths are described: Tarsolepis elephantorum sp. nov., Poncetia bovoculosugens sp. nov., P. doisuthepica sp. nov., P. huaykaeoensis sp. nov., all from Doi Suthep, Chiang Mai Province, Thailand; T. equidarum sp. nov., P. siamica sp. nov. from elsewhere in northern Thailand; and P. bhutanica sp. nov. from Bhutan and Meghalaya, India. The subspecies P. albistriga sphingoides and P. a. kanshireiensis are new synonyms of P. albistriga albistriga; P. fuscipennis comb. nov. is a new combination transferred from Ramesa. Nocturnal field research during 17 years in Thailand, western Malaysia and other countries has shown T. elephantorum, T. equidarum, T. remicauda, P. albistriga, P. bovoculosugens, P. huaykaeoensis and Pydnelia rosacea to be lachryphagous: male moths suck lachrymal secretions from eyes, and/or other fluids from the body, of Asian elephant (Elephas maximus), Malayan tapir (Tapirus indicus), black rhinoceros (Diceros bicornis), 4 deer (Hyelaphus porcinus [Cervus porcinus], C. unicolor, C. dama and C. elaphus) and 2 antelope species (Boselaphus tragocamelus and Antilope cervicapra), and 5 species of domestic ungulates (horses, mules, donkeys, buffaloes and cattle). P. rosacea drank tears from the author's eye 8 times, Tarsolepis elephantorum 3 times, and many more unsuccessful attacks were experienced. This is the first report of Notodontidae feeding on human tears. Details are given of the moths' distribution, habitats, types of food, feeding behaviour, host preferences, host reactions, and seasonal abundance. Reasons for the sucking of tears by, and its restriction to, nocturnal Lepidoptera are offered..

*BENZON, B Rhino black or white?.
The Field, 189, 1947. 529.
ECOLOGY.

BEZUIDENHOUT, J D SCHNEIDER, H P Studies on the biology of cosmiomma Hippopotamensis in South-West Africa.
Journal of the South African Veterinary Association, 43(3), 1972. 301-304.
VEGETATION.

*BOURQUIN, O VINCENT, J HITCHINS, P M The vertebrates of the Hluhluwe game reserve-corridor (state land)-Umfolozi game reserve complex.
Lammergeyer, 14, 1971. 5-58.
HLUHLUWE GAME RESERVE; BEHAVIOUR; UMFOLOZI GAME RESERVE; DISTRIBUTION.

BRIDGEFORD, P A Feeding associations between birds and mammals in the Skeleton Coast Park South West Africa.
Madoqua, 14(2), 1985. 185-186.
SKELETON COAST PARK; ECTOPARASITES.

*BURTON, J The rhino - dangerous and endangered.
Rainbow, 147, 1979. 8-9.
ECOLOGY.

*CLARKE, J E Game elimination as a means of tsetse control with special reference to host preferences.
The Puku, 2, 1964. 67-75.
TSETSE FLIES.

*DALES, D H Black and white rhinos in the Umfolosi game reserve.
Redwing, Journal of the St. Andrew's College Natural History Society, 1966. 32.
UMFOLOZI GAME RESERVE.

*DARLING, F F Wild life in an African territory: a study made for the Game and Tsetse Control Department of Northern Rhodesia.
1960. 160. Oxford: Oxford University Press.
ECOLOGY; STATUS; ZAMBIA.

*DEANNE, N N Black rhinoceros, Diceros bicornis.
Lammergeyer, 2(2), 1962. 48.
ECOLOGY.

*DEANNE, N N Rhino scratch.
Natal Wildlife, 3(1), 1962. 9.
ECOLOGY.

*DENYER, L C Black rhinoceros Diceros bicornis (notes on feeding nos. 27 and 29).
Lammergeyer, 21(1), 1962. 66-67.
ECOLOGY.

EMSLIE, R H Resource partitioning between the five major grazing ungulates in the Umfolozi Game Reserve Natal South Africa. IN: Symposium on Competition and Coexistence held by the Zoological Society of Southern Africa, Pietermaritzburg, South Africa, July 23-25, 1985.
South African Journal of Science, 81(11), 1985. 698-699.
UMFOLOZI GAME RESERVE; COEXISTENCE: FEEDING.

*EVANS, P G H Habitat preferences of ungulates in closed savanna of central Africa.
Mammal Review, 9(1), 1979. 19-32.
HABITAT; ECOLOGY.

*FOSTER, J B COE, M J The biomass of game animals in Nairobi National Park, 1960-1966.
Journal of Zoology, 155, 1968. 413-425.
NAIROBI NATIONAL PARK; ECOLOGY.

FRAME, G W The black rhinoceros.
Animals, 13(15), 1971. 692-699.
BEHAVIOUR; MANAGEMENT.

GROBLER, J H JONES, M A Population statistics and carrying capacity of large ungulates in the Whovi Wild area Rhodes Matopos National Park Zimbabwe Rhodesia.
South African Journal of Wildlife Research, 10(1), 1980. 38-42.
POPULATIONS; RHODES MATOPOS NATIONAL PARK; ZIMBABWE.
Population data for introduced large ungulates, are presented to demonstrate population growth in terms of numbers and biomass in the Whovi Wild Area of the Rhodes Matopos National Park, Zimbabwe Rhodesia. Peak calving in relation to food requirements of different species is discussed. Standing crop of large ungulates was calculated and compared with carrying capacity as predicted by Coe et al. (1976). The area now contains populations of 17 spp. of large ungulates. White rhino Ceratotherium simum, zebra Equus burchelli, hippo Hippopotamus amphibius, warthog Phacochoerus aethiopicus, giraffe Giraffa camelopardalis, buffalo Syncerus caffer, eland Taurotragus oryx, roan Hippotragus equinus, sable H. niger, waterbuck Kobus ellipsiprymnus, tsessebe Damaliscus lunatus, wildebeest Connochaetes taurinus and impala Aepyceros melampus have been introduced while non-introduced species include bushpig Potamochoerus porcus, kudu Tragelaphus strepsiceros, bushbuck T. scriptus and reedbuck Redunca arundinum. 251.

*HALL-MARTIN, A J Ecology and management of black rhinos in South Africa.
Game Coin, 1983. 44-48,66.
MANAGEMENT; ECOLOGY.

*HARTMANN, F Rhino.
Africana, 4, 1970. 16-19.
ECOLOGY; STATUS.

*HAYMAN, R W The rhinoceroses.
Zoo Life, 11, 1956. 2-6.
ECOLOGY.

*HENKEL, J S Plant and animal ecology of the Hluhluwe Game Reserve. Report. 1937. Pietermaritzburg, Province of Natal:
HLUHLUWE GAME RESERVE; PLANTS; ECOLOGY.

*HITCHINS, P M Black rhinoceros Diceros bicornis.
Lammergeyer, 2 (1), 1962. 66.
ECOLOGY.

*HITCHINS, P M The black rhinoceros.
The Conservationist, 1, 1969.
ECOLOGY.

*HOBLEY, C W The rhinoceros.
Journal of the Society for the Presentation of the Fauna of the Empire, 14, 1931. 18-23.
ECOLOGY.

HUSTLER, K Host preference of oxpeckers in the Hwange National Park Zimbabwe.
African Journal of Ecology, 25(4), 1987. 241-246.
OXPECKERS.
Yellowbilled oxpeckers Buphagus africanus and redbilled oxpeckers B. erythrorhynchus occur sympatrically in Hwange National Park. Two separate areas of the park were surveyed for oxpeckers and their host preferences. Yellowbilled oxpeckers preferred buffalo Syncerus caffer, black rhinoceros Diceros bicornis and white rhinoceros ceratotherium simum, white rebilled oxpeckers preferred sable Hippotragus niger, giraffe Giraffa camelopardalis and kudu Tragelaphus strepsiceros. Differences in oxpecker numbers, host choice and niche expansion in the absence of certain hosts are discussed. 154.

*JOUBERT, E An ecological study of the black rhinoceros (Diceros bicornis Linn., 1758) in South West Africa.
1969. MSc thesis. Pretoria: University of Pretoria.
THESES; NAMIBIA.

JOUBERT, E ELOFF, F C Notes on the ecology and behavior of the black rhinoceros Diceros bicornis in South-West Africa.
MADOQUA, 1(3), 1971. 5-53.
BEHAVIOUR; NAMIBIA; CONSERVATION.

LEUTHOLD, W Ecological separation among browsing ungulates in Tsavo East National Park Kenya.
Oecologia. 35(2), 1978. 241-252.
BEHAVIOUR; TSAVO NATIONAL PARK.
Data on food habits and habitat preferences of 4 browsing herbivores (black rhinoceros Diceros bicornis, giraffe Giraffa camelopardalis, gerenuk Litocranius walleri and lesser kudu Tragelaphus imberbis were analyzed to assess niche width for each species and niche overlap between pairs of species. All 4 spp. depended heavily on woody plants as food, and overlap in the utilization of different plant types (trees and shrubs, herbs, grasses, etc.) was very great in 3 of 6 spp. pairs. When individual plant species were considered, markedly less overlap was apparent. Three of the 4 ungulate species preferred the most densely wooded vegetation type. Overlap in habitat preferences tended to be least in those pairs of species with the greatest dietary overlap, which resulted in some degree of ecological separation. This was further increased by differences in browsing level. Seasonal variations in the browsing level of the giraffe had the effect of reducing overlap with the other species in the dry season, when food was in relatively short supply. Whether or not actual competition existed among the 4 ungulate species could not be established; in any event, it would probably be less important than possible competition exerted by the elephant Loxodonta africana, the dominant herbivore by far in the ecosystem. The ecological separation evident among the 4 browsing species probably permitted them to coexist in the area before the elephant reached its present dominant position and started altering the original vegetation. Premna resinosa, P. oligotricha, Hymenodictyon parvifolium, Calyprotheca taitensis, Euphorbia scheffleri, Boscia coriacea, Lawsonia inermis and Salvadora persica were discussed. 280.

LEUTHOLD, W Home range, movements and food of a buffalo herd in Tsavo National Park.
East African Wildlife Journal, 10(3), 1972. 237-243.
HABITAT; TSAVO NATIONAL PARK.
The feeding habits of a herd of wild buffalo (Synerus caffer) in the Tsavo National Park in Kenya were studied by counting of the number of bites taken from a particular plant species. The diet was 95% grasses, mainly Digitaria macroblephara and Panicum maximum. Apart from grasses the only other monocotyledon eaten to any great extent was Commelina sp. which formed 2.65% of the diet. Dicotyledons were 2.4% of the diet although at least 33 species were recorded as being eaten occasionally. No browsing on shrubs or trees was seen. The feeding habits of a tame female buffalo were studied. There was wide variation in diet between tame and wild buffalo. The tame buffalo ate 64% grasses, with Dactyloctenium spp the main species, and 12% woody plants. Difference in habitat may account for all or part of the differences in choice of diet, also the fact that the tame buffalo was herded with young elephants and black rhinoceros..

*LOUTIT, B D A study of the survival means of the black rhino (Diceros bicornis) in the arid areas Damaraland and Skeleton Coast Park.
Quagga, 7, 1984. 4-5.
NAMIBIA.

MEISWINKEL, R Afrotropical culicoides a redescription of Culicoides-kanagai new-record Khamala and Kettle 1971 reared from elephant dung in the Kruger National Park South Africa.
Onderstepoort Journal of Veterinary Research, 54(4), 1987. 585-590.
CULICOIDES; DUNG.
The discovery of Culicoides kanagai in South Africa represents a new record for this species. The female is redescribed, and the male is described for the first time. Culicoides (A.) dasyops Clastrier, 1958 is shown to be closely related to it but C. (A.) alticola is only superficially related. Short notes on the larval habitat of C. kanagai, the dung of the African elephant, Loxodonta africana, are given. The dung of both the white rhinoceros, Ceratotherium simum, and the black rhinoceros, Diceros bicornis, is considered to be a possible alternative site for the immatures of C. kanagai. 147.

*MENTIS, M T A review of some life history features of the large herbivores of Africa.
Lammergeyer, 16, 1972. 1-89.
BEHAVIOUR.

*MENTIS, M T Estimates of natural biomasses of large herbivores in the Umfolozi game reserve area.
Mammalia, 34 (3), 1970. 363-393.
UMFOLOZI GAME RESERVE.

*MITCHELL, B L The survival of an archaic vertebrate (Diceros bicornis) in Central Africa.
The Puku, 4, 1966. 190-192.
ECOLOGY.

*MOSS, C The black rhinoceros.
Portraits in the wild, 1976. 62-87. London: Hamish Hamilton.
ECOLOGY.

#O'CONNOR, The behavioral ecology of the white rhinoceros at the Whipsnade Zoological Park.
1982. MPhil thesis. Cambridge: University of Cambridge.
ECOLOGY; UNITED KINGDOM; WHIPSNADE ZOOLOGICAL PARK; THESES.

*O'DONOGHUE, B Operation hook-lip.
Outpost, June, 1971. 7-12.
ECOLOGY.

*OWEN-SMITH, N Megaherbivores; the influence of very large body size on ecology.
1988. 786pp. Cambridge: Cambridge University Press.
ECOLOGY.

*OWEN, T R H The black and white rhinoceroses.
Uganda Wildlife and Sport, 1, 1956. 27-31.
UGANDA.

*STUTTERHEIM, C J Cleaning symbiosis involving pied crows and white rhino.
Lammergeyer, 30, 1980. 61.
CROWS; ECTOPARASITES; BEHAVIOUR.

VAN GYSEGHEM, R Observations on the ecology and behaviour of the northern white rhinoceros Ceratotherium simum cottoni.
Zeitschrift fur Saugetierkunde, 49(6), 1984. 348-358.
MURCHISON FALLS NATIONAL PARK; UGANDA; POPULATIONS; HABITAT; BEHAVIOUR; FEEDING.
A population of the northern white rhinoceros, C. s. cottoni, was studied in the Murchison Falls National Park, Uganda, from Sept. 1977-July 1978. Population status, social organization, territorial behavior, habitat utilization, activity patterns and feeding ecology were investigated. 200.

WILKINSON, D Behaviour of magpies feeding on backs of large mammals.
British Birds, 78(1), 1985. 49-50.
MAGPIES.

ENDOCRINOLOGY

HENRY, J S LANCE, V A CONLON, J M Primary structure of pancreatic polypeptide from four species of Perissodactyla (Przewalski's horse, zebra, rhino, tapir).
General and Comparative Endocrinology, 84(3), 1991. 440-446, illus.
PROTEINS; POLYPEPTIDE.

HENRY, J S LANCE, V A CONLON, J M Purification and characterization of insulin and the C-peptide of proinsulin from Przewalski's horse zebra rhino and tapir Perissodactyla.
General and Comparative Endocrinology, 89(2), 1993. 299-308.
INSULIN.
Within the order Perissodactyla, the primary structure of insulin has been strongly conserved. Insulin from Przewalski's horse and the mountain zebra (suborder Hippomorpha) is the same as that from the domestic horse and differs from insulin from the white rhinoceros and mountain tapir (suborder Ceratomorpha) by a single substitution (Gly .fwdarw. Ser) at position 9 in the A-chain. A second molecular form of Przewalski's horse insulin isolated in this study was shown to represent the .gamma.-ethyl ester of the Glu17 residue of the A-chain. This component was probably formed during the extraction of the pancreas with acidified ethanol. The amino acid sequence of the C-peptide of proinsulin has been less well conserved. Zebra C-peptide comprises 31 amino acid residues and differs from Przewalski's horse and domestic horse C-peptide by one substitution (Gln30 .fwdarw. Pro). Rhino C-peptide was isolated only in a truncated form corresponding to residues (1-23) of intact C-peptide. Its amino acid sequence contains three substitutions compared with the corresponding region of horse C-peptide. It is postulated that the substitution (Pro23 .fwdarw. Thr) renders rhino C-peptide more liable to proteolytic cleavage by a chymotrypsin-like enzyme than horse C-peptide. C-peptide could not be identified in the extract of tapir pancreas, suggesting that proteolytic degradation may have been more extensive than in the rhino. In contrast to the ox and pig (order Artiodactyla), there was no evidence for the expression of more than one proinsulin gene in the species of Perissodactyla examined. 13.

MCFARLANE, J R CABRERA, C M COULSON, S A PAPKOFF, H Partial purification and characterization of rhinoceros gonadotropins growth hormone and prolactin comparison with the horse and sheep.
Biology of Reproduction, 44(1), 1991. 94-101.
HORMONES.
The rhinoceros is an endangered species related to the horse family. Little is known of its reproductive endocrinology. The objectives of this study were to partially purify rhinoceros pituitary hormones, determine the which assays could be used for their assessment, and to ascertain whether rhinoceros LH possesses the intrinsic FSH activity of equine LH. A single pituitary each from a White (1.3 g) and a Black (1.2 g) Rhinocerous was homogenized and extracted (pH 9.5), then subjected to pH and salt fractionation, and ion-exchange chromatography (DEAE and Sephadex SP-C50) to yield partially purified fractions of LH, FSH, growth hormone (GH), and prolactin (PRL). LH was readily measured by a rat Leydig cell assay (0.1-1% .times. equine LH) and an RIA using a monoclonal antibody to bovine LH (6-11% .times. equine LH). FSH activity detected in the LH by either an FSH RIA or a calf testis radioreceptor assay (RRA) was extremely low. No FSH activity could be detected in the White Rhinocerous pituitary "FSH" fraction, but was readily detected in the Black Rhinoceros fraction (RIA: 0.2% .times. equine FSH; RRA: 0.8% .times. equine FSH). The presence of GH and PRL was determined by SDS-PAGE and Western blots. Results showed a single immunoreactive GH band and multiple immunoreactive PRL bands. Absorption with Concanavalin A-Sepharose indicated that some of the PRL bands ad glycosylated. 70.

MILLAR, R P AEHNELT, C Application of ovine luteinizing hormone radio immunoassay in the quantitation of luteinizing hormone in different mammalian species.
Endocrinology, 101(3), 1977, 760-768.
HORMONES.
A sensitive double antibody radioimmunoassay was developed for measuring luteinzing hormone (LH) in various African mammalian species, using rabbit anti-ovine LH serum (GDN 15) and radioiodinated rat LH or ovine LH. Serum and pituitary homogenates from some African mammals as well as the domestic sheep, cow and horse and laboratory rat and hamster produced displacement curves parallel to that of the ovine LH standards. The species studied were: the cheetah (Acinonyx jubatus), spotted hyena (Crocuta crocuta), spring-hare (Pedetes capensis), porcupine (Hystrix africae-australis capensis), ground squirrel (Xerus inauris), bontebok (Damaliscus dorcas dorcas), blesbok (D. dorcas phillipsi), reedbuck (Redunca arundinum), sable (Hippotragus niger), roan antelope (H. equinus), impala (Aepyceros melampus(, tsessebe (D. lunatus), springbok (Antidorcas marsuplalis), thar (Hmitragus jemlahicus), bush baby (Galago crassicaudatus), rhinoceros (Ceratbotherium simum) and rock hyrax (Procavia capensis). The specificity of the assay was examined in detail for 1 sp., the rock hyrax. Radioimmunoassay and bioassay estimates of LH in hyrax pituitaries containing widely differing quantities of pituitary hormones were similar. In sexually active male hyrax mean plasma LH was 12.1 ng/ml and pituitary LH 194 .mu.g/gland, but in sexually quiescent hyrax mean plasma LH was 2.4 ng/ml and mean pituitary LH 76 .mu.g/gland. I.v. injection of 10 .mu.g of luteinizing hormone releasing hormone increased mean LH levels in hyrax from 0.9 ng/ml to 23.2 ng/ml by 30 min. Conversely, i.m. injection of 250 .mu. g testosterone induced a fall in LH levels in male hyrax from 1.7 ng/ml to 0.7 ng/ml 6 h after administration. Although the specificity of the assay for quantitating plasma LH in other species was not categorically established, there was a good correlation between plasma LH concentration and reproductive state in the bontebok, impala, spring-hare, thar, cheetah, domestic horse and laboratory rat, suggesting the potential use of the antserum in quantitating LH in a variety of mammalian species. 305.

MORTON, D J KOCK, N Some properties of pineal gland hydroxyindole o methyltransferase from black rhinoceros Diceros bicornis.
Journal of Pineal Research, 8(1), 1990, 35-40.
STRESS; PINEAL GLAND; S ADENOSYLMETHIONINE; N ACETYLSEROTONIN; TRAUMA; TRANSLOCATION.
Pineal glands were obtained from two young female black rhinoceri that had died as a result of postcapture trauma during a translocation exercise. Hydroxyindole-O-methyltransferase (HIOMT) from these pineal glands showed a peak activity at pH 8.2, although high activity extended over a fairly wide pH range (7.8-8.4). N-acetylserotonin was the best hydroxyindolic substrate for the enzyme, although other hydroxyindoles were methylated, the relative affinities being similar to values previously reported for bovine HIOMT. Kinetic analyses revealed that black rhinoceros HIOMT was subject to substrate inhibition by both substrates at high concentration; this observation is unlikely to have physiological significance. The catalytic mechanism was found to be ordered Bi-Bi, in which S-adenosylmethionine is the obligatory first substrate to bind to the enzyme, such binding allowing for binding of the hydroxyindolic substrate followed by catalysis, products again leaving the catalytic site in a sequential fashion. 84.

EVOLUTION

AMATO, G D ASHLEY, M GATESY, J Molecular evolution in living species of rhinoceros: implications for conservation. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 114-122, illus. San Diego: Zoological Society of San Diego
EVOLUTION; GENETICS.

HOOIJER, D A Phylogeny of the rhinocerotids of Africa.
Annals of the South African Museum, 71, 1976. 167-168.
PHYLOGENY; DISTRIBUTION; GENETICS; ANATOMY.

LOOSE, H Pleistocene Rhinocerotidae of W. Europe with reference to the recent two-horned species of Africa and S.E.Asia.
Scripta Geologica, 33, 1975. 1-59.
EVOLUTION.

PROTHERO, D R Fifty million years of rhinoceros evolution. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 82-91, illus. San Diego: Zoological Society of San Diego.
EVOLUTION.

RAMAEKERS, F C S VAN KAN, P L E BLOEMENDAL, H A comparative study of beta crystallins from ungulates whale and dog.
Ophthalmic Research, 11(3-4), 1979, 143-153.
BIOCHEMISTRY; BETA CRYSTALLINS.
The major .beta.-crystallins in the ocular lens of the whale Balaenoptera acutorostrata dog Canis familiaris, 4 spp. from the order Artiodactyla (calf Bos taurus, sheep Ovis aries, hog Sus scrofa and goat Capra hisens) and 3 perissodactyls (rhino Dicerois bicornis, tapir Tapirus indicus and donkey Equus asinus) were isolated and compared by means of gel electrophoretic techniques and immunodiffusion. Although these .beta.-crystallins were not identical, a high degree of similarity existed between animals of the same order. All species had 1 major component (.beta.Bp) with identical electrophoretic properties, shared by both .beta.H(igh)-crystallin and .beta. L(ow)-crystallin. This polypeptide apparently had a conservation character in evolution. The most striking differences between artiodactyls and perissodactyls were in the .beta.H-aggregates. One polypeptide designated as . beta.B1 in the calf occurred in the artiodactyl species, but not in the perissodactyls. The whale and dog had a polypeptide immunologically related to .beta.B1 from calf. Loss or profound structural change of this polypeptide must have occurred in the course of perissodactyls evolution. 263.

FEEDING

EMSLIE,R H ADCOCK, K Feeding ecology of black rhinos.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 65-81 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
ECOLOGY.

*LETLEY, O P Square-lipped rhinoceros, Ceratotherium simum: note on feeding no 31.
Lammergeyer, 2(1), 1962. 67.
FEEDING; GROWTH.

MUKINYA, J G Feeding and drinking habits of the black rhinoceros in Masai-Mara Game Reserve.
East African Wildlife Journal, 15(2), 1977. 125-138.
FEEDING; MASAI-MARA GAME RESERVE; PLANTS.
Feeding and drinking habits of the black rhinoceros (Diceros bicornis) population in Masai Mara Game Reserve, Kenya, were studied from May 1971-Aug. 1972. A total of 108 rhinoceros were recorded in the study area. Feeding rhinoceros were followed behind their feeding tracks until they stopped feeding (or changed to another activity) and the plants which they selected were identified. A technique was used which provided an indication of the relative importance of certain plants in the diet during May-Sept. 1971 (wet-semi-dry), Oct. 1971-Feb. 1972 (dry) and Feb.-May 1972 (wet-semi-dry). A total of 240 h were spent actually watching feeding rhinoceros in 13 distribution areas. During this period rhinoceros were observed eating 70 plant spp. from 30 botanical families. In all distribution areas rhinoceros were very selective for herbs and shrubs, and showed a marked preference for Solanum incarum, Dichrostachys cinerae and Acacia spp. Rhinoceros were also observed to visit salt licks which contained Na, Mg, K and Ca. Two feeding peaks, 1 in morning and the other in the afternoon were recorded. Black rhinoceros drank water mainly at night. They spent most of the night near watering places since they were mainly seen in the mornings walking to the feeding grounds. 312.

OLOO, T W BRETT, R YOUNG, T P Seasonal variation in the feeding ecology of black rhinoceros (Diceros bicornis L) in Laikipia, Kenya.
African Journal of Ecology, 32(2), JUN 1994. 142-157.
DIET; KENYA; ECOLOGY.
Daily indirect observations were made on the diet and feeding habits of the black rhinoceros (Diceros bicornis L.) on Ol Ari Nyiro Ranch, Laikipia, Kenya over a six-month period. Individual rhinos were followed along their feeding tracks, plants consumed by tracked animals were identified and herbivory quantified. In total, 9665 individual feeding points were recorded at 1967 feeding stations. At least 103 plant species from at least 37 families were identified as rhino food plants. The diet of black rhinos on Ol Ari Nyiro was at least as species-rich as that in bushland habitats in Tsavo National Park and considerably more species-rich than the diet of rhinos in Masai Mara Reserve. Black rhinos ate selectively and showed a marked preference for Acacia species and Phyllanthus fisheri. They apparently fed less on each plant in the dry season than in the wet season. This may be due to decreased palatability of food plants, and implies that rhinos may travel further per day in the dry season than in the wet season..

*SHELDRICK, D Feeding young rhinos.
Black Lechwe, 6(3), 1967. 8.
FEEDING; REARING; GROWTH.

UNDERWOOD, R The feeding behaviour of grazing African ungulates.
Behaviour, 84(3-4), 1983. 195-243.
FEEDING; BEHAVIOUR; PLANTS.
The organization of the foraging behavior of 10 spp. of African ungulates Raphicerus campestris, Ourebia ourebi, Aepyceros melampus, Damaliscus lunatus, Connochaetes taurinus, Equus burchelli, Hippotragus niger, Taurotiagus oryx, Syncerus caffer, Ceratotherium simum is described, with particular emphasis on locomotion while foraging and on the time spent feeding. It was predicted that foraging behavior should change with the species' body size and stomach specialization and, within a species, with the seasonal or spatial changes in the quality and availability of the food supply. Five indices were used to summarize all records obtained. Only the proportion of time spent feeding was significantly correlated with the species' body size. The 5 spp. with the largest sample sizes (reedbuck, impala, tsessebe, wildebeeste, buffalo) were used to investigate the tendency found within all study species for foraging behavior to vary seasonally. As in domestic ungulates, feeding behavior varies within a species with the proportion of low fiber, high protein, green growth in the vegetation and in the contrast in quality between the various plant parts. A multivariate analysis was used to identify the foraging characteristics of individual ruminant species. Specialist grass feeders (bulk/roughage feeders) encountered more sites more predictably and spent more time feeding off those sites than did species which were known to switch from grasses to other food sources to take advantage of changes in the relative quantity and abundance of food types in the habitat (intermediate feeders). Since pure grazers foraging is limited to a fairly continuously distributed food supply, their foraging consists mainly of teasing out and biting off grass leaves, and the organization of their foraging behavior is determined by the structure and quality of the grass sward. Intermediate feeders had the option of taking higher quality but less continuously distributed items, such as fruits, and their foraging may have involved seeking out and moving between such items. Pure grazers' foraging behavior is dominated by food capture and handling events, while intermediate feeders may be more strongly influenced by food search or pursuit requirements. It is likely that grazers differed from intermediate feeders not only in the basic organization of their foraging behavior, but also in the way that this organization was affected by the species' body size. 220.

FLIES

MINAR, J Experimental laboratory rearing of warble flies bot flies and gad flies.
Folio Facultatis Scientiarum Naturalium Universitatis Purkynianae Brunensis Biologia, 15(1), 1974. 105-109.
FLIES.

*PARSONS, B T SHELDRICK, D L W Some observations on biting flies (Diptera, Muscidae, sub-fam.Stomoxydinae) associated with the black rhinoceros, Diceros bicornis L..
East African Wildlife Journal, 2, 1964. 77-85.
FLIES.

POPHAM, E J ABDILLAHI, M Labellar micro structure in tsetse flies Glossinidae.
Systematic Entomology, 4(1), 1979. 65-70.
GLOSSINA; TSETSE FLIES.
Stereo-electron micrographs of the labellar armature of 11 spp. of Glossina indicate that the most generalized type of labellum occurs in G. palpalis, a species which feeds on a wide range of animals. The species of the G. fusca and G. morsitans groups evolved adaptations to feeding on bovids and other mammals. G. brevipalpis has a generalized type of labellum with adaptations to feeding on hippopotamus and suids and the labellum of G. longipennis is specialized for feeding on elephant and rhinoceros. The range of labellar structure within Glossina is not consistent with the traditional classification of the genus into G. fusca, G. palpalis and G. morsitans species-groups. 277.

WARNECKE, M GOLTENBOTH, R The bot-fly Gyrostigma conjungens Enderlein infesting two black rhinoceroses (Diceros bicornis L.) in the Berlin Zoological Gardens (Uber das Auftreten der Magenbremse, Gyrostigma conjungens Enderlein, bei zwei Spitzmaulnashornern (Diceros bicornis L.) des Berliner Zoologischen Gartens).
Berliner und Munchener Tierarztliche Wochenschrift, 90(8), 1977. 159-160, 2 ref., 3 fig.
FLIES; GERMANY; ZOOS.
Third instar larvae of Gyrostigma conjungens End. were discovered in the faeces of 2 black rhinoceroses (Diceros bicornis) that had recently been brought from Kenya to the zoological gardens in West Berlin, German Federal Republic. After 44 and 45 days, 3 female flies emerged from puparia. A further female fly was found in the rhinoceros house at the zoological gardens.. German Summary in English.

WRIGHT, J E OEHLER, D D JOHNSON, J H Control of house fly and stable fly breeding in rhinoceros dung with an insect growth regulator used as a feed additive.
Journal of Wildlife Diseases, 11(4). 1975. 522 524; 5 ref.
FLIES.
Diflubenzuron (TH-6040) was added to the feed of 19 rhinoceros at 0.1 or 1 mg/kg for 40 and 60 days, respectively, and eggs of Musca domestica L. and Stomoxys calcitrans (L.) were added to samples of the faeces. There was complete inhibition of adult fly emergence at both dosages until several days after treatment stopped. The residues of diflubenzuron in the faeces was found to vary from 1.8 to 12.1 p.p.m. and averaged 5.65 p.p.m. during treatment at 1 mg/kg. During treatment at 0.1 mg/kg, the levels in the faeces were lower than 0.1 p.p.m., the minimum detectable..

GAME FARMING

ANON The white rhino (Farm game series).
Natura: wildlife and safari magazine, 19, Dec 1989-March 1990. 9-11.
DESCRIPTION.

CRAWFORD, M A The case for new domestic animals.
Oryx, 12(3), 1974. 351-360.
MANAGEMENT.
Criticisms are made of the use of nitrogen retention as a measure of food conversion efficiency, particularly where water is a limiting factor. Monoculture and polyculture as methods of converting vegetation into animal products are discussed, with particular reference to African conditions. Monoculture involves the use of a single species, such as the eland, whereas polyculture involves the use of various species with complementary food preferences. A 3-tiered system of land management in the tropics is proposed, with large mammals in high-rainfall areas, cattle in areas with moderate rainfall and climate, and species such as the giraffe, eland, kudu, oryx, hartebeest, Grant's gazelle and oribi in semi-arid areas. In high-rainfall areas, species with a commercial potential are elephant, white rhinoceros, hippopotamus, African buffalo, topi, kob and warthog..

DU TOIT, J G White and black rhinoceros as game ranch animals.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 111-118 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT.

DU TOIT, R Management of black rhinos in Zimbabwean conservancies.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 95-99 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT; ZIMBABWE.

EMSLIE, R ADCOCK, K Black Rhino Project 2000.
Quagga, 23, Spring 1988. 10-11.
CONSERVATION; BLACK RHINO PROJECT 2000.

OSEMEOBO, G J Animal wildlife conservation under multiple land-use systems in Nigeria.
Environmental Conservation, 15(3), 1988. 239-249.
CONSERVATION; NIGERIA.

SMALL, C P Big game ranching in South Africa.
International Wildlife Ranching Symposium, 1st, Las Cruces, New Mexico, 1988, 1989. 141-150. Las Cruces: New Mexico State University.
GAME FARMING.

WALKER, C Black rhinos on private land - the experience of Lapalala Wilderness, South Africa.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 108-110 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT; LAPALALA WILDERNESS.

GENETICS

ASHLEY, M V MELNICK, D J WESTERN, D Conservation genetics of the black rhinoceros Diceros bicornis L. Evidence from the mitochondrial DNA of three populations.
Conservation Biology, 4(1), 1990. 71-77.
DNA.
A drastic decline in the number of black rhinoceroses (Diceros bicornis), primarily as a result of poaching, places this species in imminent danger of extinction. The remaining black rhinos are divided into small, isolated populations that are vulnerable to demographic extinction, disease epidemics, genetic drift, and inbreeding. Some conservationists have suggested minimizing these threats by moving as many animals as possible from different isolated populations to a few safe "rhino sanctuaries." To examine the possible long-term genetic consequences of such a strategy, we focused out efforts on determining the level of genetic differences among the remaining black rhino populations by examining restriction fragment length polymorphisms of the rapidly evolving mitochondrial DNA molecule. The 23 black rhinos in our survey, including animals from three geographic regions and two named subspecies, showed very little mitochondrial DNA differentiation. Only 4 out of 18 restriction enzymes revealed any mtDNA polymorphisms, and the average estimated percent sequence divergence between the four mtDNA genotypes observed as 0.17%. Mitochondrial DNA divergence between the two named subspecies, D. b. minor and D. b. michaeli, was estimated to be only 0.29%. These results indicate a very close genetic relationship among the black rhinos in our survey. Thus, the mitochondrial DNA data suggest that within national boundaries, the black rhino populations we sampled may be considered single populations for breeding purposes, which might increase the species' probability of survival. 83.

COHN, J P Genetics for wildlife conservation DNA analysis of species and subspecies provides information not available via binoculars Bioscience. 40(3), 1990. 167-168, 170-171.
CONSERVATION; DNA.

DE VOS, V Congenital unilateral aonus in a black rhinoceros Diceros bicornis bicornis (Linn., 1758).
Journal of the South African Veterinary Association, 49(1), 1978. 71; 1 ref.
CONGENITAL ABNORMALITIES; EARS.
South Africa.

*DU TOIT, R Re-appraisal of black rhinoceros subspecies.
Pachyderm, 6, 1986. 5-9.
AGE; TEETH; TAXONOMY; GENETICS.

*DU TOIT, R F FOOSE, T J CUMMING, D H M (EDS.) Proceedings of African rhino workshop.
Pachyderm, 9, 1987. 1-32.
GENETICS; MANAGEMENT; ECOLOGY; TAXONOMY; ZOOS.

#GEORGE, M PUENTES, L A RYDER, O A Genetic differences between subspecies of white rhinoceroses. IN: KLOS, H G (Ed). International Studbook of African Rhinoceroses.
1983. Berlin: Berlin Zoo.
GENETICS.

*GEORGIADIS, N Rescue the rhino genes.
Swara, 10(3), 1987. 9-11.
GENETICS.

*HALL-MARTIN, A J Kenya's black rhinos in Addo, South Africa.
African Elephant and Rhino Group Newsletter, 3, 1984. 11.
ADDO ELEPHANT NATIONAL PARK; GENETICS.

HANSEN, K M Q bands of some chromosomes of the white rhinoceros Diceros simus.
Hereditas, 82(2), 1976. 205-208.
CHROMOSOMES.
The chromosome number of the White Rhinoceros (D. simus) was established to be 84. Thirteen pairs of autosomes and the X chromosome were identified by Q-bands. 319.

HARLEY, E H O'RYAN, C Molecular genetic studies of southern African rhinoceros. IN: RYDER, O A (Ed). Rhinoceros biology and conservation. Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 101-104, illus. San Diego: Zoological Society of San Diego.
GENETICS.

HARLEY, E H O'RYAN, C Use of molecular genetics in rhinoceros conservation. Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 56-58 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
GENETICS.

*HEINICHEN, I G Karyological studies on southern African Perissodactyla.
Koedoe, 13, 1970. 51-108.
GENETICS.

*HEINICHEN, I G Karyological studies on southern African Perissodactyla.
Journal of the South African Veterinary Medical Association, 40(1), 1969. 99-100.
GENETICS.

*HITCHINS, P M Earlessness in the black rhinoceros - a warning.
Pachyderm, 7, 1986. 8-10.
EARS; ECOLOGY.

*HITCHINS, P M The black rhinoceros.
Quagga, 7, 1984. 18-19.
GENETICS.

HSU, T C BENIRSCHKE, K An atlas of mammalian chromosomes, volume 7. 1973. xvi + 248 pp. Berlin and Heidelberg, German Federal Republic New York, USA: Springer Verlag.
CHROMOSOMES.
In this latest volume of the series, illustrative plates and brief descriptions are given of the karyotypes of 51 species, arranged under Orders and Families. The eleven Orders represented are: Marsupialia (1 species), Insectivora (1 species), Dermoptera (2 species), Chiroptera (7 species from 4 Families), Rodentia (18 species from 6 Families), Cetacea (4 species from 2 Families), Carnivora (2 species), Pinnipedia (4 species), Perissodactyla (2 species of rhinoceros), Artiodactyla (7 species from 3 Families), Primates (3 species from 3 Families). Some of the rodents included in the present volume (such as Mesocricetus brandti, Phodopus sungorus, Rattus exulans and Rattus rattus) have been used for experimental purposes, while others are of potential use. Among the fur bearers are the arctic fox (Alopex lagopus) and the American red fox (Vulpes fulva). The Bovidae are represented by the Japanese serow (Capricornis crispus), the goral (Naemorhedus goral) and the sitatunga (Tragelaphus spekei). In addition to literature references to the species included in the present volume, additional references are given for species appearing in previous volumes, and a cumulative contents list and cumulative indexes of vernacular and scientific names are supplied, covering volumes 1-7. It is intended that new pages should be inserted at appropriate places in the series as a whole, so that related species are contiguous. [For Volume 6 see ABA 40, 3924.]A.P. GRAY.

*HUNGERSFORD, D A SNYDER, R L CHANDRA, S Somatic chromosomes of a black rhinoceros (Diceros bicornis Gray 1821).
American Naturalist, 101, 1967. 357-358.
CHROMOSOMES.

*HUTCHINSON, G E RIPLEY, S D Gene dispersal and the ethology of the Rhinocerotidae.
Evolution, 8, 1954. 178-179.
BEHAVIOUR; ECOLOGY.

JAMA, M ZHANG, Y AMAN, R A RYDER, O A Sequence of the mitochondrial control region TRNA-T-H-R TRNA-P-R-O and TRNA-P-H-E genes from the black rhinoceros Diceros bicornis.
Nucleic Acids Research, 21(18), 1993. 4392.
GENETICS.

MERENLENDER, A M WOODRUFF, D S RYDER, O A KOCK, R VAHALA, J Allozyme variation and differentiation in African and Indian rhinoceroses.
Journal of Heredity, 80(5), 1989. 377-382, illus.
ENZYMES; EVOLUTION.

ORYAN, C HARLEY, E H Comparisons of mitochondrial DNA in black and white rhinoceroses.
Journal of Mammalogy, 74(2), 1993. 343-346.
DNA.
Mitochondrial DNA restriction maps of Diceros bicornis, the black rhinoceros, and Ceratotherium simum, the white rhinoceros, were constructed to provide a basis for population genetic and systematic studies. The sequence divergence between DNA of the two species was calculated to be 6.79% from which it could be estimated that the time of divergence from a common ancestor was ca. 3.4 , times. 106 years ago. Little intraspecific variation was found in the 24 black rhinoceroses or the 4 white rhinoceroses studied. 10.

ORYAN, C FLAMAND, J R B HARLEY, E H Mitochondrial DNA Variation in Black Rhinoceros (Diceros bicornis) - conservation management implications.
Conservation Biology, 8(2), JUN 1994. 495-500.
POPULATIONS; ECOLOGY.
Cell cultures have been established from 33 individual black rhinoceroses. These were from wild populations from various localities in southern Africa and include representatives from three geographical regions (southwestern, south-central, and eastern) corresponding to currently accepted conservation units, and include individuals previously attributed to one of the four subspecies, Diceros b. minor, D. b. bicornis, D. b. michaeli, and D. b. chobiensis (du Toit et al. 1987). Comparative mitochondrial DNA restriction maps were constructed using 16 restriction enzymes. These , showed in each case two site differences between representative individuals from any two of the above geographical regions. Maps were monomorphic within geographical regions and, therefore, have the potential to provide diagnostic markers. The map from a single individual attributed to the D. b. chobiensis subspecies was identical to other individuals (attributed to D. b. minor) in the south-central geographical region The low amount of genetic diversity implied by these few differences renders it unlikely that problems with outbreeding depression will arise if given the continuing decline in numbers of black rhinoceroses, it becomes necessary to supplement wild or captive populations with individuals from a different conservation unit in order to avoid inbreeding depression..

OSTERHOFF, D R PETRIE, I A YOUNG, E Hemo globins in wild animals.
Journal of the South African Veterinary Association, 43(4), 1972. 361-362.
HAEMOGLOBIN.

OSTERHOFF, D R KEEP, M E Natural variation in the blood proteins of white and black rhinos.
Lammergeyer, (11), 1970. 50-53.
BLOOD.

RYDER, O A BENVENISTE, R E GEORGE, M JR CHEMNICK, L G HOUCK, M L KUMAMOTO, A T Molecular and chromosomal evolution in the mammalian order Perissodactyla, IN: Colloquium on molecular evolution held at the 18th Annual UCLA (University of California-Los Angeles) Symposia on Molecular and Cellular Biology, Lake Tahoe, California, USA, February 27-March 6, 1989.
Journal of Cellular Biochemistry, Supplement (13 Part C), 1989. 104.
DNA; EVOLUTION.

SCHAFFER, H E HELLRIEGEL, K P FISCHER, R An isolated eosinophil peroxidase defect optical and electron microscopic findings on a new enzymopathy.
Zentralblatt fur allgemeine Pathologie und pathologische Anatomie, 119(4), 1975. 330.
GENETICS; RECESSIVE AUTOSOMAL INHERITANCE.

SWART, M K J FERGUSON, J W H How vulnerable is the black rhino? A genetic and demographic analysis.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994, 55 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria
POPULATIONS.

SWART, M K J BISSBORT, S FERGUSON, J W H UNGERER, J P J Polymorphism of glucose-6-phosphate dehydrogenase in black rhinoceroses; a possible link with haemolytic anaemia.
South African Journal of Science, 90, 1994. 14-16.
ENZYMES; ANAEMIA.
Blood samples of 105 black rhinoceroses from different natural habitats were investigated and a genetic polymorphism of the erythrocyte enzyme glucose-6-phosphate dehydrogenase is described. This is the first time a polymorphism for this enzyme has been described for a wild animal; a dificiency of the enzyme in humans is associated with intravascular haemolysis. Further genetic and haematological studies need to be performed to prove the causative role of this enzyme variant for haemolytic anaemia in black rhino..

VAN DEN BUSSCHE, R A WICHMAN, H A In search of retrotransposons testing the potential of the polymerase chain reaction.
University of Maryland and the Smithsonian Institute Fourth International Congress of Systematic and Evolutionary Biology; College Park, Maryland, USA, July 1-7, 1990, 1990. Illus, paper, 331. College Park, Maryland, USA.: University of Maryland.
PHYLOGENY.

*WESTERN, D Humpty Dumpty and the rhinos.
African Elephant and Rhino Group Newsletter, 3, 1984. 4-5.
GENETICS.

WICHMAN, H A RYDER, O A HAMILTON, M J MALTBIE, M BAKER, R J Genomic distribution of rapidly evolving heterochromatic sequences in the equids,
IN: University of Maryland and the Smithsonian Institute. Fourth International Congress of Systematic and Evolutionary Biology; College Park, Maryland, USA, July 1-7, 1990..
155., 1990.
GENETICS.

WICHMAN, H A VAN DEN BUSSCHE, R A In search of retrotransposons exploring the potential of the PCR.
Biotechniques, 13(2), 1992. 258-263, 265.
PHYLOGENY.
A rapid and universal procedure for isolating reverse transcriptase encoding elements from diverse mammalian genomes using PCR is described. We have designed short, degenerate primers to conserved amino acid domains of retroviral reverse transcriptase. These primers amplify a region, predicted to be 342-396 base pairs for most mammalian retroviruses, that spans several conserved domains of reverse transcriptase. The region encoded by the amplified PCR product contains a number of highly conserved amino acids that aid in identification of either degenerate reverse transcriptase or reverse transcriptase from new, undescribed elements. Additionally, these primers allow the amplification of a piece of DNA large enough to be used for phylogenetic analysis. The primers have been used successfully to isolate a region of three related reverse transcriptases from two mammalian taxa. The generality of this approach is discussed..

WICHMAN, H A PAYNE, C T REEDER, T W Intrageneric variation in repetitive sequences isolated by phylogenetic screening of mammalian genomes, IN: CLEGG, M T and O'BRIEN, S J (Ed). UCLA (University of California-Los Angeles) Symposia on Molecular and Cellular Biology New Series, Vol. 122. Molecular Evolution; Colloquium, Lake Tahoe, California, USA, February 27-March 6, 1989..
1990. 153-160. New York: Wiley-Liss.
PHYLOGENY.

GROWTH

DITTRICH, L Observations on the early growth of a white rhinoceros Ceratotherium simum simum in the Hannover zoo.
Zeitschrift des Koelner Zoo, 14(2), 1971. 73-81.
CALF; HEAD; BEHAVIOUR.

*FREEMAN, G H KING, J M Relations amongst various linear measurements and weight for black rhinoceros in Kenya.
East African Wildlife Journal, 7, 1969. 67-72.
GROWTH; KENYA; MORPHOLOGY.

LEE, P C MAJLUL, P GORDON, I J Growth, weaning and maternal investment from a comparative perspective.
Journal of Zoology, 225 (1), 1991. 99-114.
BEHAVIOUR; CALF.

HABITAT

BORTHWICK, M R Habitat use by the white rhinoceros in relation to other grazing ungulates in Pilanesberg Game Reserve, Bophuthatswana.
1986. MSc thesis. Johannesburg: University of the Witwatersrand.
THESES; PILANESBERG GAME RESERVE.

HARRIS, L D Some structural and functional attributes of a semi arid East African ecosystem.
Dissertation Abstracts International B Sciences and Engineering, 32(3), 1971.
HABITAT.

HARRIS, L D Structural relationships of a semi arid East African herbivore community.
US IBP (International Biological Program) Analyses of Ecosystems Program Interbiome abstracts, 1(4), 1971. 259.
HABITAT.

HITCHINS, P M Influence of vegetation types on sizes of home ranges of black rhinoceros in Hluhluwe Game Reserve Zululand.
Lammergeyer, (10), 1969. 81-86.
HLUHLUWE GAME RESERVE; HABITAT; PLANTS.

MELTON, D A Habitat selection and resource scarcity.
South African Journal of Science, 83(10), 1987. 646-651, illus.
HABITAT.
English Summary in Afrikaans.

MENTIS, M T The effect of animal size and adaptation on defoliation selective defoliation animal production and veld condition, IN: 15th Congress of the Grassland Society of Southern Africa, Durban, South Africa, Jan.29-31, 1980.
Handelinge van die Weidingsvereniging van Suidelike Afrika, 15, 1980. 147-152.
GRAZING.

MIDGLEY, J J JOUBERT, D Mistletoes, their host plants and the effects of browsing by large mammals in Addo Elephant National Park.
Koedoe, 1991 VN 34(2). 149-152; 11 ref.
PLANTS; ADDO ELEPHANT NATIONAL PARK; ECOLOGY.
Comparisons were made of the frequency and size of the common mistletoes within and immediately outside the elephant enclosure of the Addo Elephant National Park, Cape Province, South Africa. The differences (mistletoes are virtually absent within the elephant enclosure, although the host tree species are present) are attributed to herbivory by large browsing mammals, mainly elephant (Loxodonta africana) and black rhinoceros (Diceros bicornis). The plant parasites are often associated with spinescent host plants, i.e. Moquinella rubra on Acacia karroo and Viscum rotundifolium on Capparis sepiaria var. citrifolia, Acacia karroo and Maytenus heterophylla. Thorns do not deter herbivores from visiting spinescent species, although they do reduce feeding rates of smaller herbivores. It is considered improbable that this association between parasites and spinescent hosts is merely coincidental. A physiological reason is suggested. Spinescence has evolved in nutritious plants, and plant parasites (like herbivores) may have selected the more nutritious plants. This physiological association may explain why Portulacaria afra, with a high dry matter leaf nitrogen content, is a preferred host for Viscum crassulae and is also a preferred food plant for elephants. It is predicted that in any plant community the selective utilization of plants by plant parasites and by large mammalian herbivores may be similar..

MWALYOSI, R B B Decline of acacia-tortilis in Lake Manyara National Park Tanzania.
African Journal of Ecology, 25(1), 1987. 51-54.
LAKE MANYARA NATIONAL PARK; BROWSING.

PIENAAR, D J BOTHMA, J D P THERON, G K Landscape preference of the white rhinoceros in the central and northern Kruger National Park.
Koedoe, 36(1), 1993. 79-85.
KRUGER NATIONAL PARK; HABITAT.
The long-term landscape preferences of the white rhinoceros for 32 different landscapes in the central and northern Kruger National Park are investigated. A preference index and a chi-square test are used to ascertain if white rhinoceroses prefer or avoid a particular landscape as habitat. Landscapes 13 (Karoo Sediment Plains with Acacia welwitschii Tree Savanna) and 11 (Slightly Undulating Granitoid Plains with Colophospermum mopane Bush Savanna), are the most preferred landscapes. Landscapes 23 (Basaltic Plains with Colophospermum mopane Shrub Savanna), 25 (Moderately Undulating Gabbroic Plains with Colophospermum mopane Shrub Savanna), 26 (Irregular Calsitic Plains with Colophospermum mopane Shrub Savanna), 28 (Alluvial Plains with Acacia albida Tree Savanna), 32 (Recent Sandy Plains with Baphia massaiensis Bush Savanna) and 33 (Slightly Undulating Andesitic Plains with Combretum collinum Shrub Savanna) appear to be avoided. Characteristics of the preferred landscapes are: moderate to dense grass cover with good quality grasses: open to moderate low-shrub (< 2 m) stratum; a moderate tree stratum; an undulating topography with uplands, bottomlands and watercourses; sandy soils with few stones and rocks on the soil surface; permanent water sources. 6.

PIENAAR, D J BOTHMA, J D THERON, G K Landscape preference of the white rhinoceros in the southern Kruger National Park.
Koedoe, 35(1), 1992. 1-7.
BEHAVIOUR; KRUGER NATIONAL PARK.
The long and short-term landscape preference of white rhinoceros in the southern Kruger National Park are investigated. A preference index and a chi-square test are used to ascertain if white rhinoceros prefer or avoid a particular landscape. Landscape 3 (moderately undulating granitoid plains with Combretum zeyheri woodland), is the most preferred landscape while landscapes 2 (low granitoid mountains with Combretum apiculatum bushveld) and 4 (granitoid lowlands with Acacia grandicornuta tree-savanna), are avoided. 17.

PIENAAR, D J The landscape preference and horn attributes of the white rhinoceros Ceratotherium simum simum (Burchell, 1817) in the Kruger National Park.
1993. MSc thesis (Wildlife Management). Pretoria: University of Pretoria.
THESES; HORN.

HAEMATOLOGY

#DU TOIT, R Haematological studies of black rhinos in Zimbabwe.
Pachyderm, 9, 1987. 28-29.
HAEMATOLOGY.

FAIRBANKS, V F MILLER, E Beta-globin chain hemoglobin polymorphism and hemoglobin stability in black rhinoceroses (Diceros bicornis).
American Journal of Veterinary Research, 51(5), 1990. 803-807; 22 ref.
HAEMATOLOGY; ANAEMIA; HAEMOGLOBIN.
To evaluate the syndrome of acute intravascular haemolytic anaemia in the black rhinoceros, the haemoglobin of this species was examined by use of isopropanol and heat-stability tests and was further characterized by electrophoretic studies. Samples were obtained from 22 apparently healthy captive North American black rhinoceroses though 3 of the study animals had survived previous haemolytic events, and 3 others were parents of 3 offspring that had suffered haemolysis. The eastern African (D. bicornis michaeli) and the southern African subspecies (D. b. minor) were represented. Comparative samples were also obtained from 2 white (Ceratotherium simum) and 1 Indian (Rhinoceros unicornis) rhinoceroses. The haemoglobin of all 3 species appeared stable when tested by use of the heat and isopropanol methods. It was concluded that an unstable haemoglobin does not appear to be involved in the haemolytic crises of captive black rhinoceroses. Black rhinoceros haemoglobin had a striking polymorphism. 13 of the samples from black rhinoceroses had a single haemoglobin band, based on results of alkaline electrophoresis. 9 had, in addition to this major band, a slow (more cathodic) minor band that comprised about 10% of the total haemoglobin. Further studies indicated that the major band and the slower minor band may contain globin chains analogous to human beta - and delta chains respectively; these bands have been tentatively designated B and C. Phenotypes B and BC are common, in a ratio of 4:3. A genetic mechanism is proposed that assumes beta b and beta c gene loci and that beta c locus-expressed (beta c+) and beta c locus-inhibited (beta co) are common alleles for the beta c locus. The polymorphism of rhinoceros haemoglobins appears to be unrelated to the acute haemolytic anaemia that occurs in this species..

#HAWKEY, C M Comparative mammalian haematology.
1975. 154-155. London: Heinemann Medical Books
HAEMATOLOGY.

PAGLIA, D E Acute episodic hemolysis in the African black rhinoceros as an analogue of human glucose-6-phosphate dehydrogenase deficiency.
American Journal of Hematology, 42(1), 1993. 36-45.
HAEMOLYSIS; ERYTHROCYTES.
Sudden episodes of massive hemolysis have become the most common cause of death among captive black rhinocerroses, and there is evidence that they occur in the wild as well. We have observed radically unique enzyme and metabolite profiles in normal rhinoceros erythrocytes compared to humans and other mammals, including marked deficiencies of intracellular adenosine triphosphate (ATP), catalase, adenosine deaminase, and other enzymes involved in glycolysis, glutathione cycling, and nucleotide metabolism. Minimal concentrations of ATP appear to impair effective acceleration of hexosemonophosphate shunt activity in response to oxidants by restricting substrate generation at the hexokinase step. Antioxidant defenses are further compromised by catalase deficiency, which may be a general characteristic of rhinoceros erythrocytes, perhaps related to the common occurrence of severe mucocutaneous ulcerative disease. It is proposed that erythrocyte ATP deficiency in rhinoceroses may be an evolutionary adaptation conferring selective advantage against common hemic parasites, comparable to the role of human glucose-6-phosphate dehydrogenase (G-6-PD) deficiency in falciparum malaria. 16.

PAGLIA, D E VALENTINE, W N MILLER, R E NAKATANI, M BROCKWAY, R A Acute intravascular hemolysis in the black rhinoceros Diceros bicornis: erythrocyte enzymes and metabolic intermediaries.
American Journal of Veterinary Research, 47(6), 1986. 1321-1325.
ERYTHROCYTES; GLYCOLYSIS; ENZYMES; HAEMOLYSIS; HAEMOLYTIC SYNDROME.
Enzymes of aerobic and anaerobic glycolysis, glutathione cycling, and nucleotide metabolism were assayed on erythrocytes from 7 healthy rhinoceroses, 2 rhinoceroses during peirods of intravascular hemolysis, and 1 rhinoceros without clinical signs of illness, which was the mother of 3 offspring with intravascular hemolytic syndrome. Measurements also were made of erythrocyte concentrations of glycolytic intermediates, adenine nucleotides, and glutathione. Although comparison of results for healthy and affected rhinoceroses did not identify an enzyme abnormality as a cause for the hemolytic syndrome, the data provided information regarding the metabolic characteristics of erythrocytes from healthy rhinoceroses. 188.

PAGLIA, D E RENNER, S W CAMBRE, R C MILLER, R E NAKATANI, M BROCKWAY, R A Erythrocyte ATP deficiency and acatalasemia in the African black rhinoceros and their pathogenetic roles in acute episodic hemolysis and cutaneous ulcerations.
Proceedings of the International Society of Hematology, 1992, 1992.
HAEMOLYSIS.

PAGLIA, D E MILLER, R E Erythrocytes of the black rhinoceros (Diceros bicornis):susceptibility to oxidant-induced hemolysis.
International Zoo Yearbook, (in press) 1994?.
ERYTHROCYTES; HAEMOLYSIS.

PAUL, B DU TOIT, R LLOYD, S MANDISODZA, A Hematological studies on wild black rhinoceros Diceros bicornis; evidence of an unstable hemoglobin.
Journal of Zoology, 214(3), 1988. 399-406.
HAEMOGLOBIN; MANA POOLS NATIONAL PARK; HAEMOLYSIS.
Baseline hematological data were obtained through routine analyses of blood samples from 31 wild black rhinoceroses captured in the Mana Pools National Park, Zimbabwe. Additional tests showed that the hemoglobin of this population is unstable; this observation helps explain the attacks of acute intravascular hemolysis documented in captive animals. 148.

#ULLREY, D E PAO, K K WHETTER, P A ROBINSON, P T Black rhinoceros (Diceros bicornis) erythrocyte stability.
Proceedings of the American Association of Zoo Veterinarians, 1989, 1989. 19-22.
ERYTHROCYTES.

VAHALA, K KASE, F RYDER, O A Hematological and biochemical values for northern white rhinoceros (Ceratotherium simum cottoni) in captivity; short communication.
Acta Veterinaria Brno, (in press) 1994?.
BIOCHEMISTRY.

HORN

ARMSTRONG, S Cuting the rhino's losses.
International Wildlife, 20(1), 1990. 22-24, illus.
CONSERVATION; DEHORNING; MANAGEMENT; NAMIBIA.

BENDIT, E G KELLY, M Properties of the matrix in keratins Part 1:The Compression testing technique.
Textile Research Journal, 48(11), 1978. 674-679.
KERATINS; STRESS STRAIN CURVE.
A technique is described for the determination of stress-strain curves of keratin specimens in longitudinal and transverse compression. The testing procedure involves use of a table-model Instron testing machine, modified to improve the linearity of the instrumental characteristic (the compliance of the machine) and to give precision of strain determinations of the order of .+-. 0.1 .mu.m, as measured by the reproducibility of the crosshead position during a stress-strain test. Procedures are discussed for the preparation of specimens with near-parallel test faces, generally in the form of cylinders or rectangular parallelepipeds of typical dimensions 200 .times. 150 .times. 100 . mu.m. The residual nonparallelism of the specimen causes the low-strain region of the stress-strain curve to be sigmoidal, resulting in an apparently linear, strictly inflexion region. Values of longitudinal and transverse inflexion moduli are reported for keratins at various relative humidities. In water, the former vary little from keratin to keratin, while the latter range from .apprx. 0.03 G Pa (pascal) for rhinoceros horn to .apprx. 1.0 G Pa for echidna quill. 278.

BERGER, J CUNNINGHAM, C GAWUSEB, A A LINDEQUE,M Costs and short-term survivorship of hornless black rhinos.
Conservation Biology, 7 (4), 1993. 920-924.
DEHORNING; CONSERVATION.

BERGER, J Rhino conservation tactics.
Nature, 361, 14 January 1993. 121.
CONSERVATION; DEHORNING.
Efforts aimed at the conservation of Africa's rhinos have increasingly taken three forms - translocation to safe reserves, attempts to halt the illicit market, and dehorning. Discussion of the pros and cons of dehorning..

*BIGALKE, R The regeneration of the anterior horn of black rhinoceros, Diceros bicornis (Linn.).
Proceedings of the Zoological Society of London, 115, 1946. 323-326.
PHYSIOLOGY.

BUT, P P H LUNG, L C TAM, Y K Ethnopharmacology of rhinoceros horn I. Antipyretic effects of rhinoceros horn and other animal horns.
Journal of Ethnopharmacology, 30(2), 1990. 157-168.
TRADITIONAL MEDICINE.
Intraperitoneal administration of an aqueous extract of rhinoceros horn at 5, 2.5 and 1 g/ml, showed a significant antipyretic effect in rats with hyperthermia induced by subcutaneous injection of terpentine oil. Similar assays with extracts of the horns of saiga antelope, water buffalo and cattle at 5 g/ml also caused a significant drop in fever; however, at 1 g/ml, only saiga antelope horn produced an antipyretic action. 75.

BUT, P P H TAM, Y K LUNG, L C Ethnopharmacology of rhinoceros horn II. Antipyretic effects of prescriptions containing rhinoceros horn or water buffalo horn.
Journal of Ethnopharmacology, 33(1-2), 1991. 45-50.
TRADITIONAL MEDICINE.
Aqueous extracts of rhinoceros horn or water buffalo horn demonstrated significant antipyretic action at 2.5 g/ml i.p. (1 ml/animal) in rats with hyperthermia induced by subcutaneous injection of turpentine oil. Quingying Decoction, a classic compound prescription composed of rhinoceros horn and eight herbs, showed significant antipyretic action at dosages equivalent at 0. 5 g/ml of rhinoceros horn extract. Comparable action was obtained by Quingying Decoction prepared with water buffalo horn. It is suggested that water buffalo horn can be used as a substitute for rhinoceros horn in treating hyperthermia, especially when prepared with other herbal materials according to the principles of compound prescriptions of Chinese medicine. 52.

BUTLER, D J DE FOREST, P R CRIM, D KOBILINSKY, L The use of isoelectric focusing to identify rhinoceros keratins.
Journal of Forensic Sciences, 35(2), 1990. 336-344.
KERATINS; FORENSIC SCIENCE.
Keratins represent the principal structural proteins of hair. They are also found in horn, nail, claw, hoof, and feather. Hair and nail samples from human and canine sources and hair samples from mule deer, white tail deer, cat, moose, elk, antelope, caribou, raccoon, and goat were studied. Parrot and goose feathers were also analyzed. Keratins are polymorphic, and species differences are known to exist. Proteinaceous extracts of deer and antelope antlers and bovine and rhinoceros horn were prepared by solubilizing 10 mg of horn sample in 200 .mu.L of a solution containing 12 M ure, 74 mM Trizma base, and 78 mM dithiothreitol (DTT). Extraction took place over a 48-h period. A 25-.mu.L aliquot of extract was removed and incubated with 5 .mu.L of 0.1M DTT for 10 min at 25.degree. C. Keratins were then separated by isoelectric focusing (IEF) on 5.2% polyacrylamide gels for 3 h and visualized using silver staining. At least 20 bands could be observed for each species studied. However band patterns differed in the position of each band, in the number of bands, and in band coloration resulting from the silver staining process. Horn from two species of rhinoceros was examined. For both specimens, most bands occurred in the pH range of 4 to 5. Although similar patterns for both species were observed, they differed sufficiently to differentiate one from the other. As might be expected, the closer two species are related phylogenetically, the greater the similarity in the IEF pattern produced from their solubilized keratin. Ten samples were removed from each species item under study and every sample was extracted and run on an IEF gel. Approximately 50 keratin extracts from each species were analyzed by IEF. 104.

*CAPUTO, R The horns of a dilemma.
Life, April, 1980. 56-60.
HORN; POACHING.

CLARKE, G P Y Inverse estimates from a multiresponse model.
Biometrics, 48(4), 1992. 1081-1094.
AGE.
In a multiresponse model, a multivariate Y is modelled as a nonlinear function of the independent variable X. The inverse estimate of X for a given observation on Y is the object of study in this paper. A straightforward method is proposed for estimating X and setting confidence limits to the estimate. An example of determining age from the lengths of horns of a rhinoceros is given. 14.

COLEMAN, J Rhino poachers kill for a few scraps of horn.
New Scientist, 140(1897), OCT 30 1993. 8, Editorial.
POACHING.

DATHE, H Ein weiteres 'Durer-Hornlein' beim Breitmaulnashorn (Ceratotherium simum).
Zoologische Garten, 60(5), 1990. 322.
ANATOMY.
German.

*DE GRAAFF, G Rhino's remarkable horn.
Custos, 16(6), 1987. 11-14.
HORN.

DE GRAAFF, G Unieke horing dra by tot renoster se uitwissing (Unique horn contributes to rhino's extinction).
Custos, 16(6), Sept 1987. 11-14.
HORN.

FISKE, S Rhinos; by the horn.
Effective Farming, Jan, 1988. 21.
HORN.

FRANZ, W SEIDEL, B JACOB, A Amputation of the horn in a white rhinoceros (Ceratotherium simum). (Klinischer Beitrag zur Hornamputation beim Breitmaulnashorn (Ceratotherium simum). IN: IPPEN, R and SCHRODER, H D (Ed).Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 1988, Sofia, 30, 1988. 353-357; 10 ref. Berlin, German Democratic Republic: Akademie Verlag.
AMPUTATION; ZOOS.
German Summaries in English, French, Russian.

GELDENHUYS, L J Dehorning black rhino; the Namibian experience.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 48-49 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
DEHORNING; NAMIBIA.

*GROVES, C P Species characters in rhinoceros horns.
Zeitschrift für Säugetierkunde, 36(4), 1971. 238-252.
HORN.

HALL-MARTIN, A J VAN DER MERWE, N J LEE-THORP, J A ARMSTRONG, R A MEHL, C I STRUBEN, S TYKOT, R Determination of species and geographic origin of rhinoceros horn by isotopic analysis and its possible application to trade control. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 123-135, illus. San Diego: Zoological Society of San Diego.
ISOTOPES.

*HALTER, F Rhinos: what shall we do?.
Swara, 5(2), 1982. 10-17.
HORN; TRANSLOCATION.

HARE, J Rhino horn.
1988. 28pp. London: Hodder and Stoughton.
BOOKS.

*HILL, A Taking the rhino by the horns.
New Scientist, 7(5), 1979. 843-844.
HORN.

*HUXLEY, C R CITES activities in relation to the ivory and rhino horn trade..
The status and conservation of Africa's elephants and rhinos; proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups. Hwange., 1981, 1981. 159-163. Hwange:
CITES; TRADE.

*JACOBI, E F Recuperative power of the horn of the black rhinoceros (Rhinoceros bicornis(L.)).
Zoologische Garten, 23 (1/3), 1957. 223-227.
TRADITIONAL MEDICINE.

KEMNITZ, P PUSCHMANN, W SCHROPEL, M KRAUSE, D SCHONING, R Feingewebliche Untersuchungen zur Struktur und Ontogenese des Hornes von Nashornern, Rhinocerotidae. Ein Atlas mit neuen Ansichten auf und uber ein altes Problem.
Zoologische Garten, 61(3), 1991. 177-199, illus.
ULTRASTRUCTURE; ANATOMY.
German.

KLOS, H G On the period of horn replacement in the square-lipped rhinoceros Ceratotherium simum.
Zoologische Garten, 36(4-5), 1969. 246-250.
PHYSIOLOGY.

KOCK, M D ATKINSON, M Report on dehorning of black and white rhinoceroses in Zimbabwe.
Journal of Wildlife Diseases Supplement, 29 (4), 1993. 10-11.
DEHORNING; ZIMBABWE.

KOCK, M E ATKINSON, M Dehorning of black (Diceros bicornis) and white rhinoceros (Ceratotherium simum simum); the Zimbabwean experience.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 42-47 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
DEHORNING.

LEADER WILLIAMS, N Desert rhinos dehorned.
Nature, 340(6235), 1989. 599-600, illus.
NAMIBIA; DEHORNING.

LEE, S K KIM, Y E Studies on the compositions of hard tissue proteins extracted from bovine horn, water buffalo horn and rhinoceros horn.
Han'guk Saenghwa Hak Hoe Chi (Korean Biochemistry Journal), 7(2), 1974. 125-142.
BIOCHEMISTRY.

LEE-THORPE, J ARMSTRONG, R VAN DER MERWE, N Isotopes and rhino horn.
The Rhino and Elephant Journal, 9, June 1994. 14-18.
ISOTOPES.
Stable isotopic 'fingerprinting' which was earlier used to pinpoint the origin of elephant ivory has since been applied to rhino horn.

LINDEQUE, M The case for dehorning the black rhinoceros in Namibia.
South African Journal of Science, 86(5-6), 1990. 226-227.
POACHING; LEGISLATION; NAMIBIA; DEHORNING; TRANSLOCATION.

MACILWAIN, C Biologists out of Africa over rhino dispute.
Nature, 368, 1994. 677.
NAMIBIA; DEHORNING.

MARTIN, C B MARTIN, E B Profligate spending exploits wildlife in Taiwan.
Oryx, 25(7), 1991. 18-20.
TRADE; WILDLIFE PROTECTION ACT.

*MARTIN, E B MARTIN, C B Horns of a dilemma.
BBC Wildlife, 3 (3), 1985. 127-131.
HORN.

*MARTIN, E B How daggers kill rhinos.
BBC Wildlife, April, 1984. 217.
HORN.

*MARTIN, E B Rhino exploitation.
1983. 122pp. Hong Kong: World Wildlife Fund.
HORN.

*MARTIN, E B Rhino horn weights.
IUCN Wildlife Trade Monitoring Unit Traffic Bulletin, 5 (2), 1983. 23.
WEIGHT.

*MARTIN, E B Rhinos and daggers; a major conservation problem.
Oryx, 19, 1985. 198-201.
HORN.

*MARTIN, E B MARTIN, C B Run rhino run.
1982. 136pp. London: Chatto and Windus.
POACHING; BOOKS.

*MARTIN, E B The conspicuous consumption of rhinos.
Animal Kingdom, 84 (1) and 84 (2), 1981. 10-19 and 20-26.
HORN.

*MARTIN, E B The rhino; grim prospects for survival.
Africana, 7, 1980. 15-19.
POACHING.

*MARTIN, E B What to do with rhino horn?.
Oryx, 16 (1), 1981. 10.
HORN.

MILNER GULLAND, E J BEDDINGTON, J R LEADER WILLIAMS, N Dehorning African rhinos: a model of optimal frequency and profitability.
Proceedings of the Royal Society of London Series B Biological Sciences, 249(1324), 1992. 83-87, illus.
DEHORNING; MANAGEMENT.

MILSTONE, L M Skin potions.
Archives of Dermatology, 123(8), 1987. 1087-1088.
TRADITIONAL MEDICINE.

MONTGOMERY, S Operation bicornis. A new initiative to save Damarland's black rhino.
African Wildlife, 43(5), 1989. 228-233, illus.
MANAGEMENT; NAMIBIA; DEHORNING.
Dehorning as conservation strategy.. Afrikaans English.

MORKEL, P V GELDENHUYS, L I Dehorning of black rhinoceros (Diceros bicornis bicornis) in Namibia. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 350-353. San Diego: Zoological Society of San Diego.
DEHORNING; NAMIBIA.

NAGASHIMA, M Effect of crude drugs on the acute mercurial poisoning.
Kagoshima Daigaku Igaku Zasshi (Medical Journal of the Kagoshima University), 26(4), 1975. 1255-1275.
HORN; TRADITIONAL MEDICINE.
In these experiments, Paramecium caudatum and dd-strain male mice were used. HgCl2 or Ch3HgCl were administered i.p. in mice. In screening tests of 159 crude drugs on P. caudatum, the drugs of 20 spp. were effective against Hg poisoning. Stricter experiments were performed on those drugs and crude drugs of 13 spp. were effective. The effects of crude drugs on HgCl2 toxicity in mice were examined with the drugs of 13 spp. which were effective in P. caudatum screening tests and 5 spp. were effective on mice. The results obtained with Ch3HgCl on P. caudatum closely resembled those obtained with HgCl2. China smilax root, honey locust seed and arrowroot were efficacious. Results similar to those with HgCl2 were obtained when CH3HgCl was administered in mice. Antidotal action was seen with arrowroot, honey locust seed and China smilax root, followed by rhinoceros horn and mulberry root white cuticle. The antidotal spectrum of crude drugs on HgCl2 or Ch3HgCl was indistinguishable with regard to acute mercuric toxicity. A number of traditional Chinese formulations had antidotal effects for Ch3HgCl poisoning. Sodium thiosulfate, cysteine, glutathione and BAL dimercaprol, modern representative antidotes, showed no antagonistic action for CH3HgCl poisoning. 322.

#NANDI, S N DEB, S K Horn cancer in a rhinoceros.
Indian Veterinary Journal, 49, 1972. 881-882.
DISEASES; CANCER.

*NATAL PARKS BOARD Nature protection in Natal and Zululand.
Oryx, 2 (1), 1953. 16-24.
NATAL; ZULULAND.

#NEUSCHULZ, N PUSCHMANN, W Verlust und Neubildung des Vorderhornes beim Spitzmashorn (Diceros bicornis). (Development and regrowth of the forward horn of the black rhinoceros).
Felis, 4, 1986. 51-54.
PHYSIOLOGY; HORN.

*PARKER, I S C MARTIN, E B Exploding some of the myths about rhino horns.
Swara, 7 (3), 1980. 12-13.
HORN.

PIENAAR, D J HALL-MARTIN, A J A method of calculating anterior horn mass in South African rhinoceroses.
South African Journal of Wildlife Research, 23(3), SEP 1993. 82-85.
WEIGHT; ETHNOPHARMACOLOGY.
The density of white rhinoceros Ceratotherium simum simum and black rhinoceros Diceros bicornis minor horn was ascertained using the mass and volume of 43 anterior and posterior horns. The horn density was then used to derive a method of calculating the anterior horn mass accurately without having to weigh the horn. It is thus possible to calculate the anterior horn mass of a live rhinoceros. The relationship between some horn measurements and horn mass were also examined using curvilinear regression. The correlations describing the relationship between horn mass and anterior horn basal circumference for males and females separately were found to be the highest..

PIENAAR, D J HALL MARTIN, A J HITCHINS, P M Horn growth rates of free-ranging white and black rhinoceros.
Koedoe, 34(2), 1991. 97-105.
AGE; PHYSIOLOGY.
The intrinsic and observed anterior horn growth of white and black rhinoceroses is discussed. The effect of age and horn rubbing on horn growth is explained. Species and sex related differences in horn size and mass are investigated. 28.

*RYDER, M L Rhinoceros horn.
Turtox News, 40, 1962. 274-277.
HORN.

*RYDER, M L Structure of rhinoceros horn.
Nature, 193, 1962.
ANATOMY.

*SAUER, E G F Fund eines Nashorn - Vorderhorns in der zentralen Namib..
Namib und Meer, 3, 1972. 21-23.
HORN; NAMIBIA.

*SHELDRICK, K Black rhinoceros with supernumary horns.
Africana, 5(11), 1975.
HORN.

SHIGEMATSU, N KOUNO, I KAWANO, N SHINTAKE, S HORI, T The water soluble amino-acids in the horns of Saiga tataria and rhinoceros spp.
Shoyakugaku Zasshi (Japanese Journal of Pharmacognosy), 36(1), 1982. 104-105.
PHYSIOLOGY.
Japanese.

SPASSOV, N Display and hyperbolization of signalizing symbols: camels and two horned rhinoceroses. IN: SPITZ, F; JANEAU, G; GONZALEZ, G & AULAGNIER, S (Eds). 'Ongules / Ungulates 91'.
Proceedings of the international symposium, Toulouse, France, September 2-6, 1991, 1992. 467-470, illus. Paris Toulouse: Societe Francaise pour l'Etude et la Protection des Mammiferes. Institut de Recherche sur les Grands Mammiferes.
EVOLUTION; MORPHOLOGY; BEHAVIOUR.

STANLEY, S M Relative growth of the titanothere horn a new approach to an old problem.
Evolution, 28(3), 1974. 447-457.
PHYSIOLOGY; BEHAVIOUR.

VAN DER MERWE, C Liewer horinglose renosters as geen renosters!.
Custos, 18(10), Jan 1990. 30-31.
DEHORNING; MANAGEMENT.

*WALKER, A J *MARTIN, E B *HONE, A Rhino horn.
Report by IMES - consultants to Mwenge International, 1979.
HORN.

*WESTERN, D Dehorn or not dehorn.
Swara, 5(2), 1982. 22-23.
DEHORNING; MANAGEMENT.

HOUSING

EBEDES, H VAN ROOYEN, J DU TOIT, J G Wildhokke en wildkampe, IN: BOTHMA, J DU P (ed). Wildplaasbestuur.
1986. 103-106. Pretoria: Van Schaik.
HOUSING.

ROGERS, P S Accommodation of the white rhinoceros Ceratotherium simum and black rhinoceros Diceros bicornis. IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 540-546. Pretoria: Wildlife Decision Support Services; South African Veterinary Foundation.

HUNTING

ADCOCK, K The role of trophy-hunting in white rhino conservation, with special reference to Bophuthatswana parks.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 35-41 Pretoria: South African Veterinary Association Wildlife Group; University of Pretoria.
HUNTING; BOPHUTHATSWANA.

CHILVERS, B Big-game hunting: will the drug-dart replace the bullet?.
African Wildlife, 47(6), November-December 1993. 248-250, illus.
HUNTING.

IMMOBILISATION/DRUGS

*ALFORD, B T BURKHART, R L JOHNSON, W P Etorphine and diprenorphine as immobilizing and reversing agents in captive and free-ranging mammals.
Journal of the American Veterinary Medical Association, 164, 1974. 702-705.
DRUGS.

#ALLEN, J L JANSSEN, D K OOSTERHUIS, J E STANLEY, T H Immobilization of captive non-domestic hoofstock with carfentanil.
Proceedings of the American Association of Zoo Veterinarians, 1991.
343-353.
DRUGS.

ANON Commercial rhino darting.
Natura; wildlife and safari magazine, 25, June/July 1991. 20.
DARTING.

#BECK, C C Chemical restraint of exotic species.
Journal of Zoo Animal Medicine, 33, 1972. 3-66.
RESTRAINT; DRUGS.

*CONDY, J B Effects of M285 and M99 on black rhinoceros.
M-Series, Veterinary Applications Report, 50, 1966. 1-4.
DRUGS.

DE VOS, V Immobilisation of free-ranging wild animals using a new drug.
Veterinary Record, 103(4), 1978. 64-68; 17 ref.
RESTRAINT; DRUGS.
Field trials were conducted with the potent morphine-like analgesic, R33799 (Janssen Pharmaceutica, Beerse, Belgium) a 4-substituted derivative of fentanyl in South African national parks on 217 free-ranging wild animals, representing 20 different species. The drug was found to be effective and safe for a wide range of ungulates and pachyderms but Burchell's zebra (Equus burchelli) did not react to expected dosage levels. A suggested dosage regime for 19 species is given. Recommended optimal dosage rates varies from about 1 mu g per kg for pachyderms to about 10 mu g per kg for most of the larger ungulates. Xylazine and azaperone were found valuable adjuncts to R33799 at dosage ratios of 10:1 and 30:1, respectively..

*DENNEY, R N Black rhinoceros immobilization utilizing a new tranquillizing agent.
East African Wildlife Journal, 7, 1969. 159-165.
DRUGS; PHYSIOLOGY.

*EBEDES, H Gemsbok and black rhinoceros immobilization with etorphine.
M-Series, Veterinary Applications Report, 57, 1967. 1-4.
DRUGS.

*FOWLER, M E Restraint and handling of wild and domestic animals.
1978, Ames: Iowa State University Press.
RESTRAINT.

#GOLTENBOTH, R KLOS, H-G Erfahrungen mit Bay VA 1470 bei der Ruhigstellung von Zootiere Berlin (Tranquilization of zoo animals).
Berliner und Munchener Tierarztliche Wochenschrift, 83, 1970. 147-151.
DRUGS; TRANQUILLISATION.

HAIGH, J C The capture of wild black rhinoceros using Fentanyl and Azaperone.
South African Journal of Wildlife Research, 7(1), 1977. 11-14.
CAPTURE; DRUGS.
A technique for the capture of 43 wild black rhinoceros Diceros bicornis using a combination of Fentanyl and Azaperone is described. One animal died and 3 others were not captured after being hit by darts. The rhinoceros, following immobilization were restrained in lateral recumbency on sledges and moved to holding corrals. Three different drug mixtures can be recommended: for adult black rhinoceros, 60 mg of Fentanyl and 200 mg of Azaperone, for large sub-adults, 45 mg of Fentanyl and 150 mg of Azaperone and for calves, 30 mg of Fentanyl and 100 mg of Azaperone. 296.

*HARTHOORN, A M Application of pharmacological and physiological principles in restraint of wild animals.
Wildlife Monographs, 14, 1965. 3-78.
DRUGS; RESTRAINT.

HARTHOORN, A M (I) Review of wildlife capture drugs in common use. (II) The drug immobilization of large wild herbivores other than antelopes. IN: YOUNG, E (Ed). The capture and care of wild animals.
1973. 14-34, 51-61. Cape Town and Pretoria: Human & Rousseau.
DRUGS; CAPTURE.
Details are given of immobilizing drugs, their chemistry, compatibility, physical properties, availability, stability, storage, preparation for use, indications, pharmacological properties, administration, recommended dosage, onset of action, peak effect, duration of action, biotransformation, after-effects and side-effects, toxicity, precautions, contraindications and antidotes. There is also reference to accidents and emergencies which may be encountered by the operator. Part II deals with chemical restraint of the principal African herbivores which include elephant, white or square-lipped rhinoceros, black or hook-lipped rhinoceros, hippopotamus, African buffalo, giraffe, zebra and warthog. The information given include body weight, usual habitat, social organization, darting areas of the body, types of syringe and needles required, drugs to be used, their dosage and reaction, methods of handling and after care. Similar information regarding carnivores and primates is given in chapters 5 and 6 of the book. The hazards associated with the use of immobilization drugs to the operator with emergency treatment for the same are also discussed in chapter 7..

*HARTHOORN, A M Methods of control of wild animals with the use of drugs, with special reference to therapeutic and veterinary aspects.
International Zoo Yearbook, 2, 1961. 302-307.
DRUGS.

*HARTHOORN, A M Problems and hazards of chemical restraint in wild animals.
International Zoo Yearbook, 8, 1968. 215-220.
DRUGS; RESTRAINT.

HARTHOORN, A M Restraint and neurolept analgesia in ungulates.
Veterinary Record, 89(6), 1971. XX.
RESTRAINT; DRUGS.

HARTHOORN, A M Restraint and neurolept analgesia in ungulates.
Veterinary Record, 91(3), 1972. 63-66.
RESTRAINT; DRUGS.

*HARTHOORN, A M Restraint of undomesticated animals.
Journal of the American Veterinary Medical Association, 149, 1966. 875-880.
RESTRAINT.

#HOFMEYER, J M The use of haloperidol as a long-acting neuroleptic in game capture operations.
Journal of the South African Veterinary Association, 52, 1981. 273-282.
DRUGS; CAPTURE.

*HOFMEYR, J M Immobilization of black rhino, eland and roan antelope with R33799.
SWA Directorate of Nature Conservation, Internal Report, 1978.
DRUGS.

*HOFMEYR, J M The introduction of R33799 in game immobilization procedures.
Interim Report, Etosha Ecological Institute, 1977.
DRUGS.

*HOFMEYR, J M Update on current drugs.
South African National and International Veterinary Congress, 3-7 September 1979, Johannesburg, 1979.
DRUGS.

*JONES, D M The use of drugs for immobilization capture and translocation of non-domestic animals.
Veterinary Annual, 1972, 1972. 320-352.
CAPTURE; TRANSLOCATION; DRUGS.

*JONES, R D A comparison between morphine and M99 as narcotics for the immobilization of the black rhinoceros (Diceros bicornis).
M series Veterinary Applications Report, 46, 1966. 1-15.
DRUGS.

KEEP, M E Etorphine hydro chloride antagonists used in the capture of the white rhinoceros Ceratotherium simum simum.
Lammergeyer, (13), 1971. 60-68.
DRUGS; CAPTURE.

KEEP, M E The immobilization and tranquillization of rhino. IN: EBEDES, H. The use of tranquillizers in wildlife. Bulletin 423.
1992. 44-46. Pretoria: Dept of Agricultural Development.
TRANQUILLISERS.

KEEP, M E TINEY, J L ROCHAT, K CLARK, J V The immobilization and translocation of black rhinoceroses Diceros bicornis using etorphine hydro chloride M 99.
Lammergeyer, (10), 1969. 4-11.
TRANSLOCATION; DRUGS.

KEEP, M E The use of etorphine hydro chloride M-99 Reckitt Fentanyl Janssen and hyoscine hydro bromide combination for field capture of white rhinoceros.
Lammergeyer, (19), 1973. 28-30.
CAPTURE; DRUGS.

KEEP, M E The use of 'Rompun' (VA 1470) Bayer on the white rhinoceros.
Journal of Zoo Animal Medicine, 4(3), 1973. 21-24.
DRUGS; TRANQUILLISERS.

KEEP, M E The use of rompun VA-1470 BAYER on the white rhinoceros.
Lammergeyer, (17), 1972. 31-35.
DRUGS; TRANQUILLISERS.

*KING, J M CARTER, B H The use of the oripavine derivative M.99 for the immobilisation of the black rhinoceros (Diceros bicornis) and its antagonism with the related compound M.285 or nalorphine.
East African Wildlife Journal, 3, 1965. 19-26.
DRUGS.

KLOEPPEL, G Immobilization of zoo animals and of wildlife.
Kleintierpraxis, 14(7), 1969. 203-207.
DRUGS.

KOCK, M D DU TOIT, R LA GRANGE, M Chemical immobilization of free-ranging black rhinoceros (Diceros bicornis) using combinations of etorphine (M99), fentanyl, and xylazine.
Journal of Zoo and Wildlife Medicine, 21(2), 1990. 155-165; 26 ref.
DRUGS; ANAESTHETICS.

#KOCK, M D Use of hyaluronidase and increased etorphine (M99) doses to improve induction times and reduce capture related stress in the chemical immobilization of free-ranging black rhinoceroses (Diceros bicornis) in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 23 (2), 1992. 181-188.
STRESS; DRUGS; CAPTURE.

#KOCK, R A JAGO, M GULLAND, F M D LEWIS, J The use of two novel alpha 2 adrenoceptor antagonists idazoxan and its analogue RX821002A in zoo and wild animals.
Journal of the Association of Veterinary Anaesth., 16, 1989. 4-10.
ANAESTHETICS; DRUGS.

MORKEL, P Chemical immobilisation of northern white rhino Ceratotherium simum cottoni.
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 78. Pretoria: South African Veterinary Association Wildlife Group.
DRUGS.

MORKEL, P Chemical immobilisation of the black rhinoceros (Diceros bicornis).
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 128-135 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
DRUGS.

MORKEL, P Drugs and dosages for capture and treatment of black rhinoceros Diceros bicornis in Namibia, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 65-68.
CAPTURE; DRUGS; NAMIBIA; ANTIBIOTICS.

MORTON, D J KOCK, M D Stability of hyaluronidase in solution with etorphine and xylazine.
Journal of Zoo and Wildlife Medicine, 22(3), 1991. 345-347, illus.
DRUGS; TRANQUILLISERS.

*PIENAAR, U DE V *VAN NIEKERK, J W *YOUNG, E *VAN WYK, P *FAIRALL, N Neuroleptic narcosis of large wild herbivores in South Africa national parks with the new potent morphine analogues M99 and M183.
Journal of the South African Veterinary Medical Association, 37(3), 1966. 277-291.
DRUGS; NARCOSIS.

RAPLEY, W A MEHREN, K G The clinical usage of Rompun xylazine in captive ungulates at the Metropolitan Toronto Zoo.
Proceedings of the American Association of Zoo Veterinarians, 1975. 16-39.
TRANQUILLISERS; DRUGS; ZOOS; CANADA.

*ROTH, H H Operatie "Noach".
Zoo Antwerpen, 30 (4), 1965. 158-166.

SMUTS, G L An appraisal of naloxone hydro chloride as a narcotic antagonist in the capture and release of wild herbivores.
Journal of the American Veterinary Medical Association, 167(7), 1975. 559-561.
CAPTURE; TRANQUILLISERS; DRUGS.

*WALLACH, J D Etorphine (M99): a new analgesic-immobilizing agent and its antagonists.
Veterinary Medicine and Small Animal Clinician, 1969. 53-58.
DRUGS.

*WALLACH, J D Immobilization and translocation of the white (square-lipped) rhinoceros.
Journal of the American Veterinary Medical Association, 149(7), 1966. 871-874.
TRANSLOCATION; CAPTURE.

IMMUNOLOGY

KELLY, P J TAGWIRA, M MATTHEWMAN, L MASON, P R WRIGHT, E P Reactions of sera from laboratory domestic and wild animals in Africa with protein A and a recombinant chimeric protein AG.
Comparative Immunology Microbiology and Infectious Diseases, 16(4), 1993. 299-305.
IMMUNOGLOBULIN.
An ELISA was developed to determine the reactivity of peroxidase labelled Protein A and a recombinant Protein A+ Protein G construct, to sera from a variety of laboratory, domestic and wild animals from Africa. There was variability in the binding capacity of sera from individuals of the same species, but four groups could be recognized. Sera from birds and crocodiles were at most weakly reactive with either Protein A or the chimeric construct. Sera from some domestic animals such as horse, goat and cat, and sera from some wild ungulates including buffalo, wildebeest, waterbuck and impala were reactive with Protein A, but reacted to a much greater degree with the chimeric construct. Sera from larger wild animals such as elephant, rhinoceros and giraffe were strongly reactive with the chimeric protein and moderately reactive with Protein A. Sera from primates and dog, pig, guinea pig and rabbit reacted strongly with both proteins. Chimeric proteins that combine the IgG binding capacities of Protein A and Protein G can be used to detect immunoglobulin from a wide variety of African wild animal species. They may thus be of great value in seroepidemiological investigations of these animal populations. S.

JOURNALS

RHINO AND ELEPHANT FOUNDATION The Rhino and Elephant Journal. 1988-. Johannesburg: Rhino and Elephant Foundation.
JOURNALS.

MANAGEMENT

*ANDERSON, J L A review of rhinoceros management in Zululand, South Africa. IN: CUMMING, D H M and JACKSON, P (eds). The status and conservation of Africa's elephants and rhinos;.
Proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, Hwange, 1981. 182pp.
ECOLOGY; ZULULAND; STATUS; TRANSLOCATION.

ANDERSON, J L Management of translocated white rhino in South Africa. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 287-293, illus. San Diego: Zoological Society of San Diego.
TRANSLOCATION; MANAGEMENT; SOUTH AFRICA.

ANON Rhino breeding sanctuary planned.
Natura; wildlife and safari magazine, 25, June/July 1991. 20-23.
CONSERVATION.

ANON Rhino proof fencing.
Natura, 6, 1985. 33.
FENCES.

ANON Run rhino run.
African Wildlife, 34(3), 1980. 5-6.
CONSERVATION; SOUTH AFRICA.

ANON White rhino popular tourist attraction.
Growth, 8 (2), 1988. 36.
TOURISM.

ANSELL, W F H Black rhinoceros in Zambia.
Oryx, 13(1), 1975. 83-84.
ZAMBIA; POPULATION.

ANSELL, W F H The black rhinoceros in Zambia.
Oryx, 10(3), 1969. 176-192.
ZAMBIA; POPULATIONS.

ATALIA, M Strategies for the conservation of rhino in Zaire. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 178-182, illus. San Diego: Zoological Society of San Diego.
CONSERVATION; ZAIRE.

BOOTH, V R JONES, M A MORRIS, N E Black and white rhino introductions in North-west Zimbabwe.
Oryx, 18(4), 1984. 237-240.
CONSERVATION; MANAGEMENT; ZIMBABWE; MATETSI PARKS & WILDLIFE AREA.

BROOKS, P M Proposed conservation plan for the black rhinoceros Diceros bicornis in South Africa, the Transkei, Bophuthatswana, Venda and Ciskei states and Namibia, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31 - 4 September, 1988.
Koedoe, 32(2), 1989. 1-30.
POPULATIONS; CONSERVATION; SOUTH AFRICA; BREEDING.

CAPTIVE BREEDING SPECIALIST GROUP Kenya black rhino metapopulation workshop.
1993. Apple Valley MN: Captive Breeding Specialist Group.
BOOKS.

CONWAY, A J GOODMAN, P S Population characteristics and management of black rhinoceros Diceros bicornis minor and white rhinoceros Ceratotherium simum simum in Ndumu Game Reserve South Africa.
Biological Conservation, 47(2), 1989. 109-122.
POPULATIONS; NDUMU GAME RESERVE; DISTRIBUTION.
The population sizes, sex and age structures, home range sizes and overlap were determined for black rhinoceros Diceros bicornis minor and white rhinoceros Ceratotherium simum simum in Ndumu Game Reserve by repeated sightings of known individuals and groups. The black rhino population in June 1986 was estimated to be 42, of which 10% were juveniles and with an adult sex ratio not differing significantlyfrom parity. Their home range varied between 4.3 km2 for a mixed group of animals and 13.8 km2for an adult female with calf. Home range overlap varied from 12 to 80%. The white rhinoceros population in June 1986 was estimated to consist of 57 animals of which 14% were juveniles. Adult sex ratio did not differ significantly from parity. Home range size varied from 2.5 no 22.9 km2 and overlapped extensively for both sexes. Both populations of rhino in Ndumu are below the proposed minimum effective population size of 50. Consequently, for both species we recommend that in conjunction with the sustained removal of animals from the population, individuals from the parent populations should be periodically introduced into the reserve to increase the effective population size. 131.

#CUMMING, D Small population management of black rhinos.
Pachyderm, 9, 1987. 12-13.
MANAGEMENT.

DE GRAAFF, G Northern white rhino a rarity.
Custos, 18(4), July 1989. 12-13.
CONSERVATION; MANAGEMENT.

DU TOIT, R Conservation biology of black rhino.
Zimbabwe Science News, 21(5-6), 1987. 63-67.
DISEASES; GENETICS; SYSTEMATICS.

EBEDES, H DU TOIT, J G VAN ROOYEN, J Die versorging van renosters op bok, IN: BOTHMA, J DU P (ed). Wildplaasbestuur.
1986. 495-497. Pretoria: Van Schaik.
MANAGEMENT.

*ELOFF, F C Kaokoland/Damaraland - ecological baselines for conservation planning (South West Africa).
World Wildlife Fund Yearbook, 1976-1977. 1977. 87-89.
KAOKOLAND; MANAGEMENT; DISTRIBUTION.

EMSLIE, R H ADCOCK, K Managing black rhinos.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 100-107 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT.

EMSLIE,R H Property assessment for the introduction of black rhinos.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 93-94 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT.

EMSLIE, R H GOODMAN, P S Towards a black rhinoceros Diceros bicornis translocation strategy to meet the aims of the conservation plan for the species in South Africa and the Transkei Bophuthatswana Venda and Ciskei states. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 81-82.
POPULATIONS; BREEDING; CONSERVATION; TRANSLOCATION.

*ENDANGERED WILDLIFE TRUST Rhinoceros in South and South West Africa. Workshop Proceedings.
1984. 23. Johannesburg: Endangered Wildlife Trust.
MANAGEMENT; ZOOS; SOUTH AFRICA; NAMIBIA.

FEUSTEL, H Sie kampfen ums uberleben: Nashorner.
Bericht des Naturwissenschaftlichen Vereins Darmstadt, 6, 1982. 9-17.
CONSERVATION; MANAGEMENT; BIOMETRICS; ECOLOGY; POPULATIONS.
GERMAN.

*GLOVER, P E SHELDRICK, D An urgent research problem on the elephant and rhino populations of the Tsavo national park in Kenya.
Bulletin of Epizootic Disease of Africa, 12(1), 1964. 33-38.
MANAGEMENT; TSAVO NATIONAL PARK; POPULATIONS.

GRIPPER, J Sebakwe black rhino project in Zimbabwe.
Ratel, 17(1), 1990. 6-9.
CONSERVATION; SEBAKWE; ZIMBABWE.

HALL-MARTIN, A J KNIGHT, M H Conservation and management of black rhinoceros in South African national parks.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 11-19 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
CONSERVATION; SOUTH AFRICA.

HEARNE, J W SWART, J Optimal translocation strategies for saving the black rhino.
Ecological Modelling, 59(3-4), 1991. 279-292.
TRANSLOCATION.
Over the past 30 years the black rhinoceros (Diceros bicornis) populations in Africa have dwindled dramatically. To enhance the survival prospects of the species, a national conservation strategy has been developed in South Africa. Its main goal is to formulate and implement policies to increase the southern African rhino population as rapidly as possible. This involves translocating animals from areas where the population is approaching the ecological carrying capacity and establishing new viable populations in other suitable reserves. A non-linear differential equation model for a population of black rhino was developed. The model is used with a combination of analytical and numerical techniques to investigate a number of issues relating to the translocation of rhino from well-stocked, high-density areas to low-density areas with small herds or no herds. Firstly, the model is used to determine the maximum sustainable yield from the well-stocked reserves. The model is then applied to a newly established population to determine optimal import policies. Finally, the model is extended to include both an established exporting population and a new understocked importing population. Simulations are performed to give an indication of the number and age of animals which should be translocated to maximise the growth rate of the total rhino population in southern Africa.
31.

HEYMANS, J C COLYN, M Pour une operation de sauvetage du rhinoceros blanc-ceratotherium simum cottoni (Lydekker) - au Parc National de la Garamba (Rep. du Zaire).
Naturalistes Belg, 62(7-8), 1981. 157-165.
CONSERVATION; ZAIRE; GARAMBA NATIONAL PARK.
French.

HILL, K A Zimbabwe's wildlife conservation regime: rural farmers and the state.
Human Ecology New York, 19(1), 1991. 32-34; 23 ref., 1 tab., 1 fig.
ZIMBABWE; CONSERVATION.
The paper examines the rhino and elephant conservation policies of Zimbabwe, focusing on the historical experiences of rural farmers with colonial and post-colonial wildlife policies. It begins by defining the social and political ramifications of the current environmental conservation debate in Africa, and how these are crucially affected by rural people's perceptions of environmental goods. Next, the paper explores the exploitative colonial legacy of wildlife conservation in Zimbabwe, and how that legacy has or has not been transformed since independence. The paper pays close attention to the development of linkages between rural farmers, local conservation non-governmental organizations (NGOs), and local and national governmental bodies. Finally, the paper finds that while many positive linkages have been made between conservation authorities and rural farmers and ranchers in elephant conservation programmes, few such linkages have been made in the various rhino conservation schemes. Since Zimbabwe has been relatively successful in conserving its elephant population, but relatively unsuccessful in stopping rhino poaching, the paper concludes that the development of positive linkages between rural farmers and the state, which include high levels of popular participation at the grassroots level, is crucial for any successful natural resource policy.. Zimbabwe.

*HILLMAN,K Action to save Africa's rhinos.
IUCN Bulletin, 11(1/2), 1980. 5-7.
MANAGEMENT.

HITCHINS, P M KEEP, M E Observations on skin lesions of the black rhinoceros Diceros bicornis in the Hluhluwe Game Reserve Zululand.
Lammergeyer, (12), 1970. 56-65.
HLUHLUWE GAME RESERVE; MARKING; PARASITES.

HITCHINS, P M ANDERSON, J L Reproduction population characteristics and management of the black rhinoceros Diceros bicornis minor in the Hluhluwe corridor Umfolozi Game Reserve complex South Africa.
South African Journal of Wildlife Research, 13(3), 1983. 78-85.
POPULATIONS; UMFOLOZI GAME RESERVE.
Over a period of 13 yr (1961-1973) data were collected from a black rhinoceros population in KwaZulu, South Africa. The study population was subdivided into three subpopulations: those in the Hluhluwe and Umfolozi Game Reserves and that in the interconnecting Corridor of state land. The results were related to similar findings in rhinoceros populations in East Africa. Spermatogenesis in black rhinoceros in the Hluhluwe/Corridor/Umfolozi Game Reserve Complex commences between the age of 7 and 8 yr. The age of 1 conception ranged between 5.08 and 11 yr. Black rhino are polyestrous and the mean duration of the estrous cycle is 35 days. There is evidence that the duration of this cycle in pubertal females is more variable than that in parous animals. There appears to be a bimodal seasonal reproductive pattern, with birth peaks in midsummer and midwinter. The population density ranges from 0.1/km2 in Umfolozi to 0.7/km2 in Hluhluwe, the densest population yet recorded. In spite of a preponderance of males, the adult sex ratio did not deviate significantly from parity. Most of the known natural deaths were attributed to horn wounds sustained during fighting. Evidence is presented that hyaena predation was a major factor in calf mortality in Hluhluwe. Rates of increase of the subpopulations are discussed and conclusions regarding the future trend of these are made. A management policy is suggested bearing in mind the likely trend in the subpopulations and the current plight of the species. 216.

HOFMEYR, J M Marking technique for the identification of the black rhinoceros Diceros bicornis in arid and semi-arid ecosystems IN: Symposium on the Zoology of Arid and Semi-arid Environments, Swapokmund, Namibia, July 24-27, 1983.
South African Journal of Science, 80(4), 1984. 187-188.
HABITAT; MARKING; MIGRATION; ETOSHA NATIONAL PARK; NAMIBIA.

HOFMEYR, J M The adaptation of wild animals translocated to new areas in South-West Africa. IN: REID, R L (Ed.). Proceedings of the III World Conference on Animal Production. Melbourne, Australia, May 22-30, 1973.. 1975.. 126-131. Sidney, Australia : Sidney University Press.
TRANSLOCATION; ETOSHA NATIONAL PARK.

*JENKINS, P R Black rhino management plan.
1983. Kenya: Ministry of Tourism and Wildlife, Wildlife Conservation and Management Department.
STATUS; DISTRIBUTION; KENYA.

JOUBERT, S C J Managing threatened species in conservation areas. IN: MUNDY, P J (Ed). Proceedings of an international symposium on the extinction alternative.
1984. i-ii, 1-182. Chapter Pagination: 51-65. Johannesburg, South Africa: Endangered Wildlife Trust.
CONSERVATION.

KAYANJA, F I B Problems associated with wildlife management in the third world, IN: Transactions of the 19th Congress of the International Union on Game Biologists. Trondheim, Norway, 1989. Vol.2.
1990. 615-620.
CONSERVATION.

KEEP, M E Observable criteria for assessing the physical condition of the white rhinoceros Ceratotherium simum in the field.
Lammergeyer, (13), 1971. 25-28.
PHOTOGRAPHS.

LEDGER, J Black rhino population genetics for conservation management.
Quagga, 19, Spring 1987. 18-22.
CONSERVATION; GENETICS.

LEVER, C Lake Nakuru Kenya black rhinoceros sanctuary.
Oryx, 24(2), 1990. 90-94.
LAKE NAKURU; CONSERVATION.

LEWIS, A R WILSON, V J An evaluation of a fence in the control of wild ungulates under extensive conditions in Africa.
British Veterinary Journal, 133(4), 1977. 379-387.
FENCES; DISEASE CONTROL.
The efficacy of a 7 strand wire fence 1.9 m high and 70 km long in the control of 14 ungulate species Sylvicapra grimmia, Tragelaphus scriptus, Redunca arundinum, T. strepticeros, Hippotragus equinus, H. niger, Alcelaphus lichtensteini, Taurotragus oryx, Equus burchelli, Syncerus caffer, Loxodonta africana, Phacocoerus aethiopicus, Potamochoerus porcus, Diceros bicornis in savanna woodland was assessed from quantitative behavioral data over a 15 mo. period after fence construction. A large measure of control was achieved over medium sized and larger species. In relation to the requirements for disease control, the most promising results were achieved in the control of the larger gregarious antelopes.
294.

LOUTIT, R OWEN SMITH, G The auxiliary game guard system in northwestern Namibia and its role in black rhinoceros Diceros bicornis conservation, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 85-86.
NAMIBIA; CONSERVATION; POACHING.

MAGGS, K A R GREEFF, J DE V Special measures to protect the Kruger National Park rhino population.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 20-24 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
KRUGER NATIONAL PARK; CONSERVATION.

MARGIN, R B Rhino population dynamics, illegal hunting and law enforcement in the lower Zambezi Valley in Zimbabwe. IN: RYDER, O A (Ed) Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 10-31, illus. San Diego: Zoological Society of San Diego.
CONSERVATION; ZIMBABWE; POPULATIONS; POACHING; ZAMBEZI VALLEY.

MUKINYA, J G An identification method for black rhinoceros Diceros bicornis.
East African Wildlife Journal, 14(4), 1976. 335-338.
PHOTOGRAPHS; MARKINGS; HORN.
A method involving the use of a camera equipped with telephoto lens and high speed film was used and from the photographs taken, designated marks were used for classification of ears, horns and wrinkles on the face. Effectiveness of this method is discussed. 303.

MUKINYA, J G Density distribution population structure and social organization of the black rhinoceros in Masai-Mara Game Reserve.
East African Wildlife Journal, 11(3-4), 1973. 385-400.
MASAI-MARA GAME RESERVE; POPULATIONS; DISTRIBUTION.

NDUKU, W K MARTIN, R B Development of the Zimbabwe national conservation strategy for black rhinoceros. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 186-195. San Diego: Zoological Society of San Diego.
CONSERVATION; ZIMBABWE.

NG'WENO, F Rhino man.
SWARA, 11(5), 1908. 22-23, illus.
CONSERVATION; KENYA.

NOVELLIE, P HALL MARTIN, A J JOUBERT, D The problem of maintaining large herbivores in small conservation areas; deterioration of grassveld in the Addo Elephant National Park, Addo, South Africa.
Koedoe, 34(1), 1991. 41-50.
ADDO ELEPHANT NATIONAL PARK; HABITAT; ECOLOGY.
Changes in vegetation cover and species composition in a grassland community during a six year period are reported. The grass Themeda triandra and the dwarf shrub Helichrysum rosum decreased in abundance, whereas the grass Eragrostis obtusa increased. Comparison of grazed plots with fenced plots revealed large herbivores were responsible for the increase in abundance of E. obtusa. The abundance of T. triandra was influenced by large herbivores, but rainfall fluctuations apparently also played a role. The decline in relative abundance of H. rosum was evidently not caused by large herbivores. Grass cover was closely determined by rainfall. A drought-induced decline in forage abundance evidently caused the buffalo population to crash. 43.

OWEN-SMITH, N The white rhino overpopulation problem and a proposed solution.
Problems in management of locally abundant wild mammals, 1981. 129-150.
Academic Press.
UMFOLOZI GAME RESERVE; POPULATIONS.

OWEN SMITH, R N Dispersal and the dynamics of large herbivores in enclosed areas; implications for management. IN: OWEN SMITH, R N (Ed). Management of large mammals in African conservation areas.
1983. 127-143, illus. Pretoria: HAUM Educational Publishers.
ECOLOGY; POPULATIONS.

PIENAAR, D J DU TOIT, J G Wit en swart renosters. IN: BOTHMA, J DU P (Ed). Wildplaasbestuur.
in press (1994).
MANAGEMENT.

PIENAAR, U D V The re colonization history of the square-lipped white rhinoceros Ceratotherium simum simum Burchell in the Kruger National Park October 1961 November 1969.
Koedoe, (13), 1970. 157-169.
KRUGER NATIONAL PARK; CONSERVATION; POPULATIONS.

*RUSSEL, N Kenya takes action on its rhino waifs.
Africana, 3(1), 1967. 33-39.
MANAGEMENT; KENYA.

*SAVIDGE, J The introduction of white rhinoceros into the Murchison Falls National Park, Uganda.
Oryx, 6(3), 1961. 184-189.
MANAGEMENT; MURCHISON FALLS NATIONAL PARK.

*SAVIDGE, J M Second introduction of white rhino into Murchison Falls National Park, Uganda.
1964. 6. Mimeograph.
MANAGEMENT; MURCHISON FALLS NATIONAL PARK.

SCHMIDT, A G Guidelines for the management of some game ranches in the mixed Bushveld communities of the north-western Transvaal, with special reference to Rhino Ranch.
1993. MSc thesis (Wildlife Management). Pretoria: University of Pretoria.
THESES; CONSERVATION.

*SUTHERST, R W How Kenya saves its rhinos.
Animals, 4(8), 1964. 215-219.
MANAGEMENT; KENYA.

*TOMLINSON, D N S White rhinos return to Rhodesia.
Oryx, 14(2), 1977. 143-150.
ZIMBABWE; MANAGEMENT.

VINCENT, J Movement of square-lipped rhinoceroses Ceratotherium simum simum.
Lammergeyer, 12, 1970. 73.
TRANSLOCATION; ZOOS; UMFOLOZI GAME RESERVE.

VON RICHTER, W Black rhinoceros and square-lipped rhinoceros in Botswana.
Biological Conservation, 5(1), 1973. 59-60.
BOTSWANA; CONSERVATION.

ZIMBABWE MINISTRY OF ENVIRONMENT AND TOURISM Zimbabwe black rhino conservation strategy.
1992. 1-69, illus. Harare: Department of National Parks and Wild Life Management.
CONSERVATION; BREEDING; TRANSLOCATION; ZIMBABWE; ECOLOGY; POPULATIONS.

MICROBIOLOGY

MACKIE, R I WILKINS, C A Enumeration of anaerobic bacterial microflora of the equine gastrointestinal tract.
Applied and Environmental Microbiology, 54(9), 1988. 2155-2160.
DIGESTIVE TRACT; BACTERIA.
Samples from the duodenum, jejunum, and ileum, as well as from the cecum and colon, were obtained from 11 mature grass-fed horses. Viable counts of total culturable and proteolytic bacteria were made on habitat-simulating media containing 40% clarified ruminal fluid. The mean pHs in the duodenum, jejunum, and ileum were 6.32, 7.10, and 7.47, respectively; the mean pH decreased to 6. 7 in the hindgut. The acetate concentration increased along the length of the small intestine and was the only volatile fatty acid present in this gut segment. Molar proportions of acetate, propionate, and butyrate in the hindgut were 85:10:3. Differences in bacterial counts on habitat-simulating media containing equine cecal fluid or clarified ruminal fluid were negligible. Bacterial counts showed a substantial population in the duodenum (ca. 2.9 . times. 106 wet weight of sample), and this increased to 29.0 .times. 106 in the jejunal and 38.4 .times. 106 in the ileum. Proteolytic bacteria formed a high proportion of the total culturable bacteria, especially in duodenal samples. Counts of proteolytic bacteria per gram (wet weight) of sample were 3. 0 .times. 106, 15.6 .times. 106, and 22.0 .times. 106 in the duodenum, jejunum, and ileum, respectively. There was a close relationship between luminal and mucosal bacterial counts, although actual values were lower in mucosal samples. The mucosal bacterial population in the duodenum was high relative to the lumenal population. Although the comparison of bacterial populations in the hindgut of the horse and white rhino was limited to a single animal, the results were of interest. Counts were higher in the cecum than in the colon for both the horse and the white rhino. Counts of cellulolytic and hemicellulolytic bacteria in the horse were 10- to 100-fold higher than those in the white rhino, despite higher total culturable counts in the white rhino. The results of the study with the horse are discussed in relation to the possible role of the intestinal bacterial flora, especially the mucosal bacterial population, in the etiology of colic. 141.

MILNE, A THEODOROU, M K JORDAN, M G C KING SPOONER, C TRINCI, A P J
Survival of anaerobic fungi in feces in saliva and in pure culture.
Experimental Mycology, 13(1), 1989. 27-37.
FUNGI; FAECES.
Anaerobic fungi were isolated from the feces of British sheep, the feces of Ethiopian sheep and Ethiopian cattle, and the feces (collected at London Zoo) of 11 other herbivorous mammals (Arabian oryx, Asian elephant, bactrian camel, black rhinoceros, bongo, common zebra, greater kudu, gaur, llama, roan antelope, and vicuna). Anaerobic fungi could not be isolated from moist sheep feces (kept in plastic bags) that had been stored in air at 20 or 39.degree. C for 1 day or longer. However, they were isolated from dried sheep feces (dried in air at 20 or 39.degree. C) that had been stored in air at 20 or 39.degree. C up to 128 days, and from sun-baked and dry feces of Ethiopian sheep and cattle. Anaerobic fungi were also isolated from sheep salvia that had been stored in air at 39.degree. C up to 8 h. Anaerobic fungi were also isolated from sheep saliva that had been stored in air at 39.degree. C up to 8 h. When Neocallimastix sp., isolate R1 (an anaerobic fungus isolated from the rumen of sheep), was grown in anaerobic culture at 39.degree. C, it remained viable for 5 days in medium containing glucose and for 15 days in a medium containing wheat straw. Cultures of Neocallimastix sp., isolate R1, grown anaerobically in glucose-containing defined medium for 3 days remained viable up to 14 h after they had been aerated and then stored in air at 39.degree. C. the R1 isolate also survived up to 18 h in colonized straw particles that had been removed from anaerobic cultures and then dried and stored in air at 20.degree. C. The results are discussed in relation to the survival of obligately anaerobic fungi in nature and the transfer of anaerobic fungi between animals. 132.

TEUNISSEN, M J SMITS, A A M HUIS IN'T VELD, J H J VOGELS, G D OP DEN CAMP, H J M Fermentation of cellulose and production of cellulolytic and xylanolytic enzymes by anaerobic fungi from ruminant and non-ruminant herbivores.
Archives of Microbiology, 156(4), 1991. 290-296; 31 ref.
CELLULOSE; ENZYMES; FUNGI; DIGESTION.
Anaerobic fungi were grown on filter paper cellulose and monitored over a 7-8 day period for substrate utilization, fermentation products, and secretion of cellulolytic and xylanolytic enzymes. Two of the fungi (N1 and N2) were Neocallimastix species isolated from a ruminant (sheep) and the other 2 fungi were Piromyces species (E2 and R1) isolated from an Indian elephant and an Indian rhinoceros, respectively. The tested anaerobic fungi degraded filter paper cellulose almost completely and estimated cellulose digestion rates were 0.25, 0.13, 0.21 and 0.18 g/litre per hour for strains E2, N1, N2, R1, respectively. All strains secreted cellulolytic and xylanolytic enzymes, including endoglucanase, exoglucanase, beta glucosidase and xylanase. Strain E2 secreted the highest concentration of enzymes in a relatively short time. The product formation on avicel by enzymes secreted by the fungi was studied. In the presence and absence of glucurono 1,5 delta lactone, a specific inhibitor of beta glucosidase, mainly glucose was formed, but no cellobiose. Therefore the exoglucanase secreted by the fungi is probably a glucohydrolase..

MILK

*ASCHAFFENBURG, R GREGORY, M E ROWLAND, S J THOMPSON, S Y The composition of the milk of the African black rhinoceros.
Proceedings of the Zoological Society of London, 137, 1961. 475-479.
PHYSIOLOGY.

GACHEV, E P Comparative analysis of the osmotic components of milk.
Comptes Rendus de l'Academie Bulgare des Sciences, 25(8), 1972. 1149-1151.
MILK; PHYSIOLOGY.
Milk from rabbit, rat, cow, sheep and man was studied by the author and also data from the literature on elephant, goat, rhinoceros, guineapig and horse. Values are tabulated. In mosmol/litre lactose ranged from 58 for rabbit to 219 for man, K+ from 13 for man to 56 for rabbit and Na+ from 9 for man to 31 for rabbit. Each increase in lactose was accompanied by a compensatory decrease in K+ and Na+. The ratio K+/Na+ seemed to tend towards the average value, 1.9 plus or minus 0.14..

*GREED, R E The composition of the milk of the black rhinoceros.
International Zoo Yearbook, 2, 1961. 106.
ECOLOGY; PHYSIOLOGY.

#GREGORY, M E ROWLAND, S J THOMPSON, S Y Changes during lactation in the composition of the milk of the black rhinoceros, Diceros bicornis.
International Zoo Yearbook, 5, 1965. 154.
PHYSIOLOGY; LACTATION.

KLOS, H G JAROFKE, D LANGNER, H J SIEMS, H MALEK, E The chemical and microbiological composition of rhinoceros milk.
Zuchthygiene (Berl) (Reproduction in Domestic Animals), 9(4), 1974.
150-153.
PHYSIOLOGY; MILK.

#KON, V M Changes during lactation in the composition of the milk of the African rhinoceros (Diceros bicornis Linn.).
Proceedings of the Zoological Society of London, 145, 1965. 327-333.
PHYSIOLOGY; LACTATION.

SMITH, A Milk from wild mammals.
Proceedings of the South African Society of Animal Production, 9(1), 1970.
63-72.
MILK.

MORPHOLOGY

*BORCHERDS, P B Letter to his father Rev. Meent Borcherds (undated). Pp.
205-235. IN: Somerville, W (Ed.). Narrative of his journeys to the Eastern Cape frontier and to Lattakoe 1799-1802.
1979. Cape Town: Van Riebeeck Society.
MORPHOLOGY; DISTRIBUTION; TAXONOMY.

*CAVE, A J E Observations on rhinoceros tongue morphology.
Journal of Zoology, 181, 1977. 265-284.
TONGUE; ANATOMY.

*CAVE, A J E Postcava structure in elephant and rhinoceros.
Journal of Zoology, 157(2), 1969. 247-257.
MORPHOLOGY.

*GROVES, C P Geographic variation in the black rhinoceros Diceros bicornis (L., 1758).
Zeitschrift für Säugetierkunde, 32(5), 1967. 267-276.
AGE; TEETH; MORPHOLOGY; TAXONOMY.

*GROVES, C P On the rhinoceroses of South-East Asia.
Säugetierkundliche Mitteilungen , 15(3), 1967. 221-237.
MORPHOLOGY.

*KUBIAK, H DZIURDZIK, B Histological characters of hairs in extant and fossil rhinoceroses.
Acta biologica Cracoviensia, serie Zoologie, 16 (1), 1972. 55-61.
HAIR.

LYNCH, L J ROBINSON, V ANDERSON, C A A scanning electron microscope study of the morphology of rhinoceros horn.
Australian Journal of Biological Sciences, 26(2), 1973. 395-399.
SCANNING ELECTRON MICROSCOPY; HORN.

MALUF, N S R Renal morphology of the hook-lipped African rhinoceros Diceros bicornis Linnaeus.
American Journal of Anatomy, 90(3), 1991. 245-265.
ANATOMY; KIDNEY.
The kidney of Diceros bicornis has about 60 lobes, all appearing peripherally. These are separated by interlobar septa, except for small septal defects through which tubules pass. Renal capsule and interlobar septa are fibromuscular and contain small blood vessels. The kidney is about 65% cortex. It contains about 12.5 x 106 glomeruli, which form about 7% of the cortical mass and 4.6% of the renal mass. Diameter of a glomerular capsule is about 244 .mu.m, there being no difference in size across the cortex in these adults. The ureter bifurcates into a cephalic and a caudal, fibromuscular, urothelial-lined conduit, into which open about 23 urothelial-lined infundibula. The common large collecting duct, or tubus maximus, of every lobe opens at the apex of its infundibulum. Two tubi may join into one infundibulum. The tubi and their terminal collecting ducts (of Bellinis) are part of the inner medullar. Musculature of conduits and infundibula is largely longitudinal. The calyx may be represented by a circular muscle bindle near the apex of every infundibulum. The large intralobar veins are partly adherent to their infundibulum and calyx and receive arcuate veins via valved orifices. Most brances of the renal artery enter via the interlobar septa. Within a septum they branch again and also supply numerous perforators, which thence enter the cortex. Remaining branches of the renal artery enter cortex directly from without. A fibromuscular scaffolding lies deep ot arcuate veins where they contact medulla. Where these veins contact cortical tubules; however, their walls become merely endothelium, like the walls of the interlobular veins. 63.

MUELLER, F On a phylogenetic change in the Eutheria ontogeneses attempt at a survey based on morphological studies of Marsupialia and Eutheria.
Revue Suisse de Zoologie, 79(4), 1972. 1599-1685.
MORPHOLOGY; EVOLUTION.

*POTTER, H B MITCHELL, D E Rhino - black or white.
Field, 190, 1947. 384-385.
MORPHOLOGY.

PRINS, H H T Geographic variation in skulls of the nearly extinct small black rhinoceros Diceros bicornis michaeli in northern Tanzania.
Zeitschrift fur Saugetierkunde, 55(4), 1990. 260-269, illus.
TANZANIA; SKULL.
Skull morphology variation, conservation and taxonomic significance.
English Summary in German.

*RITCHIE, A T A The black rhinoceros (Diceros bicornis L.).
East African Wildlife Journal, 1, 1963. 54-62.
AGE; BEHAVIOUR; HORN.

SHOSHANI, J Cuvier vis-a vis Huxley on the relationship of hyracoidea and an update on an old controversy. IN: SPITZ, F, et al (Ed).
Ongules/Ungulates 91.
International Symposium, Toulouse, France, September 2-6, 1991, 1992. 103-112. ISBN 2-905216-29-8. Paris, France Toulouse, France: Societe Francaise pour l'Etude et la Protection des Mammiferes. Institut de Recherche sur les Grands Mammiferes.
PHYLOGENY; TAXONOMY.

NUTRITION

DIERENFELD, E S CITINO, S B Circulating plasma alpha tocopherol following a single injection in a black rhinoceros Diceros bicornis.
Journal of Wildlife Diseases, 25(4), 1989. 647-648.
NUTRITION; VITAMIN E DEFICIENCY.
Injectable all rac-.alpha.-tocopherol, at a dose of 12.4 IU/kg body mass, increased circulating levels of .alpha.-tocopherol in the black rhinoceros (Bicornis diceros) from 0.18 .mu.g/ml to 1.47 .mu.g/ml within 2 hr. Although the plasma level peaked at Day one (13.07 .mu.g/ml) and dropped rapidly, substantial residual effects were seen even 10 days (1.50 .mu.g/ml) following a single injection. It appears that parenteral vitamin E administration may be suitable for therapeutic treatment of vitamin E deficiency in the black rhinoceros. 120.

HERRMANN, V M MILLER, R E Total parenteral nutrition on a premature rhinoceros calf.
Nutr. Clin. Prac., 6, 1991. 193-196.
CAPTIVE CARE; CALF.

KIRKWOOD, J K Nutrition of zoo animals; some recent developments. IN: Agriculture Group of the Society of Chemical Industry Symposium on Alternative Livestock; Nutrition and Management, London, England, February 20, 1990.
Journal of the Science of Food and Agriculture, 53(1), 1990. 126-128.
DIET; VITAMIN E.

#KIRKWOOD, J K EVA, J JACKSON, S I The nutrition and growth of a hand-reared low birth weight rhinoceros (Diceros bicornis) during her first six months.
Proceedings of the American Association of Zoo Veterinarians, 1989, 1989. 32-41.
CALF; REARING.

PARASITES

#BAYLIS, H A A new species of Oxyuris (Nematoda) from a rhinoceros.
Annals and Magazine of Natural History, 3, 1939. 516-524.
NEMATODES.

BIGALKE, R D KEEP, M E KEEP, P J SCHOEMAN, J H A large babesia sp and the theileria like piroplasm of the square-lipped rhinoceros.
Journal of the South African Veterinary Medical Association, 41(4), 1970. 292-294.
BABESIA; PIROPLASM.

*BROCKLESBY, D W A Babesia species of the black rhinoceros.
Veterinary Record, 80(15), 1967. 484.
BABESIA; ECOLOGY.

CLAUSEN, B Survey for trypanosomes in black rhinoceros Diceros bicornis.
Journal of Wildlife Diseases, 17(4), 1981. 581-586.
TRYPANOSOMES; DRUGS.
Blood samples were taken from 39 black rhinoceros (D. bicornis), usually soon after they were captured. The blood was examined microscopically for trypanosomes; and most samples were tested for trypanosome serum antibodies and inoculated into small laboratory animals. Serum antibodies were found in most animals and trypanosomes identified as Trypanosoma brucei were found in 7 of 39 (18%) of the rhinoceros. Berenil (diminazene aceturate) did not effect complete elimination of trypanosomes. In spite of treatment, 1 rhinoceros died of trypanosomiasis. 240.

CRUZ E SILVA, J A ROQUE, M M A MENDONCA, M M DE [Helminthiasis as a factor of fundamental health importance in wild animals in captivity] (As helmintoses como factor de fundamental importancia sanitaria nos animais selvagens em cativeiro).
Revista Portuguesa de Ciecias Veterinarias, 68(428), 1973. 260-274; 3 plates.
HELMINTHS; NEMATODES.
Investigations at Lisbon Zoo show the immense importance of parasites and the value of appropriate control measures. Faecal examination of 242 animals of 58 species revealed parasitism in 125 animals of 31 species. Parasites most frequently involved were: Strongylidae (excluding Ancylostomatidae) in 65 animals-elephant, gorilla, anteater and different ungulates, Trichuris sp. in 31 animals-camel, giraffe, rhinoceros and ape, Parascaris equorum in 24 zebra, Toxascaris sp. in 17 carnivores, Strongyloides sp. in ungulates and primates, Ancylostomatidae in carnivores and ape, Ascaris lumbricoides in an ape, Oxyuridae in a chimpanzee, and coccidia in a wolf and a rhinoceros. Parasites collected P.M. were Ophidascaris filaria (from python), Ascaridia sp. and Raillietina sp. (dove), Echinococcus polymorphus, Trichuris ovis and T. globulosa (giraffe), Parascaris equorum (zebra), Dipetalanema gracile, Molineus torulosum and Mathevotaenia sp. (apes), Chontangium magnostomum, Equinurbia sipunculiformis, Murshidia falcifera and M. murshida (Indian elephant).. Portuguese Summaries in English, French.

ERZINCLIOGLU, Y Z The means of attachment of the larvae of horse zebra and rhinoceros botflies Diptera gasterophilidae.
Med Vet Entomol, 4(1), 1990. 57-60.
DIPTERA; BOTFLIES.
The unusual structure of the mouth hooks of the third instar larvae of the species of Gasterophilus and Gyrostigma, parasites of the alimentary canal of Equideae and Rhinocerotidae respectively, is described. 115.

#GARROD, A H On the Taenia of the rhinoceros of the Sunderbunds (Plagiotaenia gigantea Peters).
Proceedings of the Zoological Society of London, 1877. 788-789.
TAENIA; CESTODES.

GILCHRIST, F M C HAMILTON ATTWELL, V L VAN HOVEN, W Intestinal ciliated protozoa of African rhinoceros: two new genera and five new species from the white rhino (Ceratotherium simum Burchell, 1817).
Journal of Protozoology, 34(3), 1987. 338-342; 9 ref.
PROTOZOA.
Phalodinium digitalis gen.nov., sp.nov., Arachnodinium noveni gen.nov., sp. nov., Monoposthium vulgaris sp.nov., M. bracchium sp.nov., and M. latus sp.nov. , from the colon of C. simum shot in South Africa, are described. The genus Arachnodinium includes cycloposthiids without caudalia and possessing 9 tentacles around the mouth; Phalodinium includes cycloposthiids without caudalia and possessing multiple caudal appendages. The recovered species constituted between 1% and 10% of the total ciliate population (= 1 X 105/ml digesta) in the ascending colon. Very small numbers were observed in the descending colon, indicating temporary accommodation only..

HORAK, I G The arthopod burdens of various free-living, threatened mammals species.
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 84. Pretoria: South African Veterinary Association Wildlife Group.
PARASITES.

*KEEP, M E A check list of the blood parasites recorded from the larger wild mammals in Zululand.
Lammergeyer, 11, 1970. 54-57.
ZULULAND.

#KEEP, M E KEEP, P J SCHOEMAN, H J A large Babesia sp. and a theileria-like piroplasm of the square-lipped rhinoceros.
Journal of the South African Veterinary Association, 41, 1970. 291-294.
PIROPLASM; BABESIA.

KOCK, N KOCK, M D Skin lesions in free-ranging black rhinoceroses (Diceros bicornis) in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 21(4), 1990. 447-452, illus.
SKIN.

MELTON, D A Waterbuck (Kobus ellipsipyrmnus) population dynamics: the testing of an hypothesis..
African Journal of Ecology, 25(3), 1987. 133-145, illus.
PARASITES.
English Summary in French.

PENZHORN, B L KRECEK, R C HORAK, I G VERSTER, A J M WALKER, J B BOOMKER, J D F KNAPP, S E QUANDT, S K F Parasites of African rhinos; a documentation.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 168-175 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
PARASITES.

REDDY, K R KHAN, D K M G A RAMAKRISHNA, K Balantidiosis in white rhinos..
Livestock Adviser, 9(5), 1984. 49-52; 9 ref.
BALANTIDIOSIS.
A male and a female white rhinoceros at the Nehru Zoo, Hyderabad developed diarrhoea. Balamidium coli cysts and trophozoites were identified in faeces. Symptoms were fetid diarrhoea with mucus, loss of appetite, weakness and emaciation. Various antiprotozoal agents were tested, of which Dequinol tablets [composition not stated] gave the best results.. India, Andhra Pradesh.

*ROUND, H C A new species of Stephanofilaria in skin lesions from the black rhinoceros, Diceros Bicornis, in Kenya.
Journal of Helminthology, 38, 1964. 87-96.
KENYA; HELMINTHOLOGY; SKIN.

*TREMLETT, J G Observations on the pathology of lesions associated with Stephanofilaria dinniki from the black rhinoceros.
Journal of Helminthology, 38, 1964. 171-174.
PARASITES; PATHOLOGY.

USUI, M HORII, Y Oxyuris karamoja new record recovered from white rhinoceroses.
Bulletin of the Faculty of Agriculture Miyazaki University, 32(1), 1985. 211-216.
OXYURIS KARAMOJA; SOUTH AFRICA; JAPAN.
Oxyuroid nematodes have been collected from the feces of South African white rhinoceroses, Ceratotherium simum, imported to a zoological park in Oita Prefecture, Japan. After a morphological observation, it was identified as Oxyuris karamoja Baylis 1939. This is the second report of O. karamoja since the original description of Baylis (1939). The white rhinoceros is added as a new host of O. karamoja, and South Africa is also described as a new locality of this parasite. 194.

VAN HOVEN, W GILCHRIST, F M C HAMILTON ATTWELL, V L A new family genus and seven new species of Entodiniomorphida protozoa from the gut of African rhinoceros.
Journal of protozoology, 35(1), 1988. 92-97.
PROTOZOA; RHINOZETA.
This report deals with a group of ciliated protozoa with short ciliary bands found mainly in the cecum of black rhinoceros, Diceros bicornis (Linnaeus, 1758), and white rhinoceros, Ceratotherium simum (Burchell, 1817) from southern Africa. A new genus, Rhinozeta, based on the sum total of the characteristics of seven new related species is described. The species described are R. rhinozeta n. sp., R. triciliata n. sp., R. caecalis n. sp., R. addoensis n. sp., R. cristata n. sp., R. multiplatus n. sp., and R. unilaminatus n. sp. The specific features of the new genus make it incompatible with any of the known families of the Order Entodiniomorphida containing the ciliates present in the digestive tract of herbivorous mammals. This merits the creation of a new family, the Rhinozetidae. 151.

VAN HOVEN, W GILCHRIST, F M C HAMILTON ATTWELL, V L Intestinal ciliated protozoa of African rhinoceros two new genera and five new species from the white rhino Ceratotherium simum Burchell 1817.
Journal of Protozoology, 34(3), 1987. 338-342.
PROTOZOA.
This report represents the first published information on intestinal ciliated protozoa in the African white rhinoceros (Ceratotherium simum Burchell, 1817). Two new genera which do not relate to any known ciliated protozoa from the intestines of mammals and five new species are described. The ciliates were found in the colon of three of these free-living hindgut-fermenting grazers that were shot in widely spaced districts in southern Africa. Phalodinium digitalis n. gen. n. sp., Arachnodinium noveni n. gen., n. sp., Monoposthium vulgaris n. sp., M. bracchium n. sp., and M. latus n. sp. constituted between 1% and 10% of the total ciliate population (ca. 1 . times. 105/ml digesta) in the ascending colon. Exceedingly small numbers were observed in the descending colon, indicating temporary accommodation only. 164.

*ZUMPT,F Parasites of the white and black rhinoceroses.
Lammergeyer, 3(1), 1964. 59-70.
PARASITES.

PATHOLOGY

#GRINER, L A Pathology of zoo animals.
1983. San Diego: Zoological Society of San Diego.
PATHOLOGY; ZOOS.

#MURRAY, M The pathology of some diseases found in wild animals in East Africa.
East African Wildlife Journal, 5, 1967. 37-41.
PATHOLOGY; DISEASES.
Arteritis of lymph nodes and gastrointestinal vasculature in a black rhinoceros.

#NOUVEL, J PASQUIER, M A Corps etranzers gastrointestinaux des animaux sauvages en captivite (Gastrointestinal foreign bodies in captive wild animals).
Revue Pathologie Camparie et d'Hygiene Generale, 46, 1946. 41-45.
DISEASES.

PHYSIOLOGY

ALEXANDER, R M POND, C M Locomotion and bone strength of the white rhinoceros Ceratotherium Simum.
Journal of Zoology, 227(1), 1992. 63-69.
LOCOMOTION; BONES; LEGS.
Measurements have been made, of lengths and of geometic properties of cross-sections, of the long bones of the legs of a young white rhinoceros of about 750 kg body mass. These are considered in conjunction with data from film of white rhinoceros trotting and galloping. The stresses developed in the bones in running are rather low, in comparison with other large mammals, suggesting that rhinoceros skeletons may be built to unusually high factors of safety. The long, relatively straight legs of elephants (whose bones experience higher stresses) are contrasted with the shorter, less straight legs of the other graviportal mammals. 25.

*ALLBROOK, D B *HARTHOORN, A M *LUCK, C P *WRIGHT, P G Temperature regulation in the white rhinoceros.
Journal of Physiology, 143, 1958. 51-52.
PHYSIOLOGY; TEMPERATURE.

BAUMANN, R MAZUR, G BRAUNITZER, G Oxygen binding properties of hemo globin from the white rhinoceros and tapir.
Respiration Physiology, 56(1), 1984. 1-10.
HAEMOGLOBIN; GLUTAMIC ACID.
The .beta.-chain of rhinoceros Cerathotherium simum Hb contains glutamic acid GLU at position .beta.2, an important site for the binding of organic phosphates. O2 binding properties of this Hb and its interaction with ATP, 2, 3-diphosphoglycerate, CO2 and Cl- were investigated. Presence of GLU at position .beta.2 nearly abolishes the effect of organic phosphates and CO2; O2-linked binding of Cl- is not affected. Rhinoceros Hb has only protons and chloride anions as major allosteric effectors for the control of its O2 affinity. From the results obtained with Hb solutions, it can be calculated that the blood O2 affinity of the rhinoceros must be rather high with a P50 O2 partial pressure of 50% Hb saturation of about 20 torr at pH 7.4 and 37.degree. C, which conforms with observations obtained for other large mammals. 223.

*BLIGH, J HARTHOORN, A M Continuous radiotelemetric records of the deep body temperature of some unrestrained African mammals under near-natural conditions.
Journal of Physiology, 176, 1965. 145-162.
TEMPERATURE; RADIO-TELEMETRY.

BUNNELL, F L HARESTAD, A S Activity budgets and body weight in mammals; how sloppy can mammals be?.
Current Mammalogy, 2, 1990. 245-305.
PHYSIOLOGY.

CLEMENS, E T MALOIY, G M O Nutrient digestibility and gastro intestinal electrolyte flux in the elephant Loxodonta-Africana and rhinoceros Diceros bicornis.
Comparative Biochemistry and Physiology A Comparative Physiology, 75(4), 1983. 653-658.
DIGESTION; DIET.
Nutrient digestibility and absorption-secretion were studied in elephants and rhinoceros. Prehension and diet selection are discussed. Rhinoceros select less fiber, which may account for their greater digestive efficiency. Foregut digestion and fermentation were most evident in rhinoceros, while elephants possessed greater cecal-colonic digestion. Relative to rhinoceros, elephants demonstrated greater intestinal VFA volatile fatty acid absorption and less Na-K flux. 219.

CLEMENS, E T MALOIY, G M O The digestive physiology of three East African herbivores: the elephant, rhinoceros and hippopotamus.
Journal of Zoology, 198(2), 1982. 141-156; 33 ref.
DIGESTION.
Structural and physiological differences in digestive functions were studied in 3 elephants (Loxodonta africana), 3 black rhinoceros (Diceros bicornis) and 1 hippopotamus (Hippopotamus amphibius)..

DEMPSTER, W J Renal adrenal interrelationships.
Japanese Heart Journal, 19(3), 1978. 426-433.
SHOCK; HAEMORRHAGE; STRESS.
Vascular renal-adrenal interrelationships are examined from a phylogenetic and embryologic viewpoint in human, dog, rat, ape, elephant, hippopotamus and rhinoceros species. Diurnal variations in renal blood flow due to epinephrine, aldosterone and renin-angiotensin releases are described. Renal-adrenal vascular responses to stress, hemorrhage and shock are correlated to extracellular fluid volume regulation, hyperglycemia, Na+ conservation and cardiac output. 284.

DENNEY, R N Body temperatures of some wild East African ungulates.
East African Wildlife Journal, 8, 1970. 212-216.
TEMPERATURE.

ERASMUS, T HALL MARTIN, A Chemical composition of feces from large herbivores at the Addo Elephant National Park South Africa as an index of veld utilization IN: Symposium on Competition and Coexistence held by the Zoological Society of Southern Africa, Pietermaritzburg, South Africa, July 23-25, 1985.
South African Journal of Science, 81(11), 1985. 698.
ADDO ELEPHANT NATIONAL PARK; BIOCHEMISTRY: FAECES.

FRAPE, D L TUCK, M G SUTCLIFFE, N H JONES, D B Use of inert markers in the measurement of the digestibility of cubed concentrates and of hay given in several proportions to the pony horse Equus caballus and white rhinoceros Diceros simus.
Comparative Biochemistry and Physiology a Comparative Physiology, 71(4), 1982. 77-84.
DIGESTION; DIET.
The rate of passage of chromic oxide (Cr) was similar in the pony and rhinoceros. Higher apparent amounts digested were found using 4N-HCl-insoluble ash (AIA) than those determined by Cr, but overall digestibilities were similar for the 2 spp. An abrupt increase in the starch content of the horse diets increased the number of fecal ciliate protozoa. Only when the overall feed intake was increased in horses receiving a high dietary proportion of starch were the numbers depressed. When the rhinoceros received 109 kJ apparent DEdigestible energy/kg body wt daily (716 kJ/W0.75 daily) it maintained normal condition. 231.

*GREGORY, M E ROWLAND, S Y THOMPSON, S Y KON, V M Changes during lactation in the composition of milk from the African black rhinoceros (Diceros bicornis).
Journal of Zoology, 145, 1965. 327-333.
MILK; LACTATION.

HARTHOORN, A M TURKSTRA, J The influence of seasonal changes in the determination of selenium in the liver of various animals by neutron activation analysis and high resolution gamma spectrometry.
Journal of the South African Veterinary Association, 47(3), 1976. 183-186.
SELENIUM.
Se levels in the liver of animals impala, white rhinoceros, blue wildebeest, warthog living in the Umfolozi Game Reserve in Natal and in the Sabi Sand Nature Reserve in the eastern Transvaal South Africa were studied by instrumental neutron activation analysis. The distribution of the Se content was followed for about 16 mo. and attempts were made to explain seasonal fluctuations of the Se level..

HATTINGH, J DE VOS, V BOMZON, L MARCUS, E JOOSTE, C CHERTKOW, S Comparative physiology of colloid osmotic pressure.
Comparative Biochemistry and Physiology A Comparative Physiology, 67(1), 1980. 203-206.
COLLOID OSMOTIC PRESSURE.
Colloid osmotic pressure (COP) and other related parameters were measured in the serum of 20 spp. of wild animals Hippopotamus amphibius capensis, Connochaetes taurinus taurinus, Equus burchelli antiquorum, Damaliscus dorcas phillipsi, D. dorcas dorcas, Aepyceros melampus melampus, Loxodonta africana africana, Syncerus caffer, Equus zebra zebra, Taurotragus oryx oryx, Tragelaphus strepsiceros strepsiceros, Kobus ellipsiprymnus ellipsiprymnus, Hippotragus equinus equinus, Raphicerus campestris zuluensis, Sylvicapra grimmia caffra, Phacochoerus aethiopicus sundevalli, Ceratotherium simum simum, Panthera leo krugeri, P. pardus melanotica and Papio ursinus occidentalis. No significant statistical correlations could be found on an inter- or intraspecies basis between COP and albumin concentration, total serum protein concentration and the A/G albumin/globulin ratio and no theoretical or empirical formulae accurately predicted this value. Results are discussed in relation to which components in serum influence COP. This value can only be determined accurately by measurement. 250.

HILEY, P G The thermo regulatory response of the rhinoceros Diceros bicornis and Ceratotherium simum and the zebra Equus burchelli to diurnal temperature change.
East African Wildlife Journal, 15(4), 1977. 337-338.
TEMPERATURE.
A white rhinoceros (C. bicornis), a black rhinoceros (D. bicornis) and 2 zebra (E. burchelli) were exposed to ambient diurnal temperature changes in Kenya, East Africa. The mean maximum dry bulb temperature was 29.9.degree. C; the mean black bulb temperature at this time was 47.5.degree. C. Cutaneous moisture loss (CML) was recorded with a desiccant capsule, respiration frequency (RF) was recorded by counting flank movements and rectal temperature was recorded with a rectal thermometer. Each rhinoceros species was recorded at 07.00 h, 12.00 and 18.00 h; in the zebra the recordings were made hourly between 08.30 h and 17.30 h. The thermoregulatory response in the rhinoceros did not differ between species; their mean rectal temperature was 36.9.degree. C at 07.00 h and this increased to 37.9.degree. C at 18.00 h. The initial thermoregulatory response of the rhinoceros species was an increased CML, that of the zebra was an increased RF. 299.

*HITCHINS, P M Liveweights of some mammals from Hluhluwe game reserve, Zululand.
Lammergeyer, 9, 1968. 42.
GROWTH; WEIGHT; HLUHLUWE GAME RESERVE.

HOPPE, P P Strategies of digestion in African herbivores. IN: GILCHRIST, F M C & MACKIE, R I (Eds). Herbivore nutrition in the subtropics and Tropics.
1984. 1-779. Chapter Pagination: 222-243, illus. Craighall, South Africa: The Science Press (Pty) Ltd.
DIGESTION.

HOWLAND, H C HOWLAND, M MURPHY, C J Refractive state of the rhinoceros.
Vision Research, 33(18), DEC 1993. 2649-2651, Note.
REFRACTION; RETINOSCOPY; SIGHT.
Rhinoceroses have been supposed to be myopic; however, our examination of four specimens by retinoscopy, infrared photorefraction, and telescopic pointspread retinoscopy has shown them to be mildly hyperopic..

#KEEP, M E Some physiological serum normals from free living wild animals species from Natal, S.Africa.
Journal of Zoo Animal Medicine, 7, 1976. 7.
BLOOD.

KOCK, M D DU TOIT, R KOCK, N MORTON, D FOGGIN, C PAUL, B Effects of capture and translocation on biological parameters in free-ranging black rhinoceroses (Diceros bicornis) in Zimbabwe.
Journal of Zoo and Wildlife Medicine, 21(4), 1990. 414-424, illus.
TRANSLOCATION; STRESS; BLOOD; ZIMBABWE; CAPTURE.

*KOLB, K H Klinische Untersuchung und physiologische Daten des Nashornes (Diceros bicornis L.).
Berliner und Munchener Tierarztliche Wochenschrift, 71, 1958. 380-382.
PHYSIOLOGY.

LANGMAN, V A Heat balance in the black rhinoceros (Diceros bicornis).
National Geographic Society Research Repon, 21, 1985. 251-254.
TEMPERATURE.

SCHRYVER, H F FOOSE, T J WILLIAMS, J HINTZ, H F Calcium excretion in feces of ungulates.
Comparative Biochemistry and Physiology A Comparative Physiology, 74(2), 1983. 375-380.
DIET; CALCIUM; FAECES.
Fecal excretion of Ca was examined in 122 individual ungulates representing 7 spp. of Equidae, 3 spp. of Tapiridae, 3 spp. of Rhinocerotidae, 2 spp. of Elephantidae, 2 spp. of Hippopotamidae, 12 spp. of Bovidae, 2 spp. of Cervidae, 3 spp. of Camellidae and 1 sp. of Giraffidae. Animals were fed timothy hay, a low Ca diet or alfalfa hay, a high Ca diet. In a few cases oat straw or prairie hay was used instead of timothy hay. Samples of feces were obtained from individuals daily for 4 days following a 20 day dietary equilibration period. Feces of equids, tapirs, rhinoceros and elephants had a lower Ca concentration and a lower Ca/P ratio than feces of ruminants when the animals were fed diets of equivalent Ca content. Evidently, the non-ruminant ungulate equids, tapirs, rhinoceros and elephants absorb a larger proportion of dietary Ca than ruminants do. 235.

SMITH, J E CHAVEY, P S MILLER, R E Iron metabolism in captive black (Diceros bicornis) and white (Ceratotherium simus) rhinoceros.
Journal of Zoo and Wildlife Medicine, (in press) 1994?.
IRON.

SPENCER, M P HOWARD, J R GONZALEZ, R R SHERIDAN, B Comparative evidence for the function of the carotid and orbital retia.
Physiologist, 13(3), 1970. 313.
CAROTID; ORBITAL RETIA; BRAIN.

*TALBOT, L M *TALBOT, M H How much does it weigh.
Wild Life, 3(1), 1959. 47-48.
WEIGHT.

*WILSON, V J Weights of some mammals from Eastern Zambia.
Arnoldia, 1968. 1-20.
ZAMBIA; WEIGHT; GROWTH.

POACHING

*AERSG-IUCN A new effort to counter rhino poaching.
Quagga, 13, 1986. 9.
STATUS.

ANON Poaching in the Central African Republic.
Swara, 8(5), 1985. 20-21.
CONSERVATION; CENTRAL AFRICAN REPUBLIC.

*ANON Rhino poaching in Zimbabwe.
Pachyderm, 6, 1986. 18.
ZIMBABWE.

*BORNER, M SEVERRE, E Rhino and elephant poaching trends in the Selous Game Reserve.
Pachyderm, 6, 1986. 3-4.
SELOUS GAME RESERVE; POACHING.

COUPER, B Development of an intelligence information network to counter poaching and the illegal trade in trophies, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31 -September 4, 1988.
Koedoe, 32(2), 1989. 87-88.
TRADE.

*DOUGLAS-HAMILTON, I Anti-poaching: lessons from Uganda. IN: CUMMING, D H M and Jackson, P (Eds). The status and conservation of Africa's elephants and rhinos.
Proceedings of the Joint meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, 1984. Hwange:
UGANDA; POACHING.

*EAST AFRICAN STANDARD Slaughter of rhinos.
Journal of the Society for the Preservation of the Fauna of the Empire, 11, 1930. 51-54.
POACHING.

*HILLMAN, K MARTIN, E B Count-down for rhino in Kenya.
Africana, 6 (12), 1979. 5-6.
POACHING; KENYA.

*HILLMAN, K MARTIN, E B The state of the game; death knell for the rhino.
Safari, April/May, 1979. 5-6.
POACHING.

HILLMAN, K Trying to save the rhino.
Swara, 2, 1979. 22-27.
HORN.

HILLMAN, K MARTIN, E Will poaching exterminate Kenya's rhinos?.
Oryx, 15(2), 1979. 131-132.
CONSERVATION; KENYA.

*HONEY, M Mounting threat to Tanzania's big game.
New African, March 1978. 33-34.
TANZANIA.

*JENKINS, P Rhino rescue project.
Game Ranger, March, 1986. 3.
STATUS.

LARGEN, M J YALDEN, D W The decline of elephant and black rhinoceros in Ethiopia.
Oryx, 21(2), 1987. 103-106.
POACHING; POPULATIONS; ETHIOPIA.

LATEGAN, P The role of the Endangered Species Protection Unit (ESPU) of the South African Police in combating rhino poaching and smuggling of rhino horn.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 4-6 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
ENDANGERED SPECIES PROTECTION UNIT; SOUTH AFRICA; POACHING; LEGISLATION; HORN.

LAURENT, H M GUERIN, C Extermination of black rhinoceros in Tanzania.
Biological Conservation, 6(3), 1974. 228-231.
HORN; TRADITIONAL MEDICINE; TANZANIA.

LEADER WILLIAMS, N ALBON, S D BERRY, P S M Illegal exploitation of black rhinoceros and elephant populations patterns of decline law enforcement and patrol effort in Luangwa Valley Zambia.
Journal of Applied Ecology, 27(3), 1990, 1055-1087.
LUANGWA VALLEY; CONSERVATION; DISTRIBUTION.
At the start of the 1980s, conservations in Africa gave a high priority to protecting the largest remaining populations of black rhinos and elephants from illegal exploitation. This study documents the demise of both species in the Luangwa Valley, Zambia. Sightings and captures by law enforcement patrols were used to monitor (i) changes in rhino and elephant numbers during 1947-69 and 1979-85; (ii) their motivation and success at capturing offenders involved in illegal activity during 1979-85; and (iii) the distribution of illegal activity in relation to patrol effort and the abundance of rhinos and elephants during 1979-85. Sightings were analysed with log-linear models and population trends for elephants and rhinos so derived compared favourably with accurate methods of counting both species. Elephants increased at an instantaneous annual rate of +0.06 from 1947 to 1969, causing the 'elephant problem' of the 1960s and 1970s. Sightings of rhinos and elephants were negatively correlated in different areas of Luangwa Valley during this period. The overall rates of decline of rhinos and elephants were -0.63 and -0.12 during 1979-85, following rapid increases in the price of rhino horn and ivory on world markets. These declines aorse from illegal activity as most skulls had their trophies removed. Sightins of rhinos and elephants changed at different rates in each area of Luangwa Valley. Rhinos declined in all areas ar rates ranging from -0.99 to -0.24, but elephants increased in some areas due to local immigration. By 1985 there was a positive correlation between sighting rates of rhinos and elephants. Despite these large declines in rhino and elephant numbers, law enforcement units were motivated and successful at capturing offenders involved in illegal activity in Luangwa Valley during 1979-85. Most staff in law enforcement units spent about half each month patrolling on foot under remote and difficult conditions. Offenders caught on foot patrols provided information for making arrests more successfully on vehicle patrols. Arrests were made cost-effectively and about 40% of operating costs were recovered from found and seized ivory. Offenders involved in less serious illegal activity originated from most areas of Luanga Valley. In contrast, well-organized armed gangs exploited rhinos and elephants and originated from areas outside Luangwa Valley. Offenders who exploited rhinos and elephants were delivered sentences that did not uphold wildlife laws. Signs of illegal activity, such as poachers, their camps and fresh carcasses, were encountered throughout the year. Encounters of illegal activity generally showed consistent trends across years within different areas, but most trends in illegal activity were complex rather than exponential across time. Increased patrol effort affected levels of illegal activity. Poachers and camps tended to be seen less often in more heavily patrolled areas even though these held a relative abundance of quarry. Finds of fresh carcasses declined with rhino and elephant numbers, but also were found less frequently in areas of heavier patrol effort. Differences in patrol effort were related directly to rates of change in rhino and elephant abundance, and were sufficient to create areas of relative safety which experienced local immigrations of elephants and lower declines of rhinos. However, predictions suggest that a decline in rhinos could only have been prevented if all available manpower in law enforcement units had been concentrated in one small area. Law enforcement staff need to be deployed at effective densities of at least one man per 20 km2 of protected area. The overall conclusion was that the manpower within law enforcement units was effective at capturing poachers, but was too small to provide protection to the large populations of rhinos and elephants over a

such a vast area as Luangwa Valley. 72.

LEADER WILLIAMS, N Patterns of depletion in a black rhinoceros population in Luangwa Valley Zambia.
African Journal of Ecology, 26(3), 1988. 181-188.
LUANGWA VALLEY; TRADE; HORN.
Black rhinos in Luangwa Valley, Zambia have been subjected to heavy illegal hunting since the late 1970s. A study population monitored by individual recognition decreased at an instantaneous rate of -0.29 yr-1 between 1981 and 1985. Two-thirds of skulls found throughout Luangwa Valley between 1979 and 1985 were axed, indicating death from poaching. All age- and sex-classes of rhino were equally susceptible to being shot, presumably due to the high market-price of rhino horn. 139.

*MARTIN, E B Mass destruction of rhino.
IUCN Bulletin, 15, 1984. 107.
HORN.

MILNER-GULLAND, E J LEADER-WILLIAMS, N A model of incentives for the illegal exploitation of black rhinos and elephants; poaching pays in Luangwa Valley, Zambia.
Journal of Applied Ecology, 29 (2), 1992. 388-401.
LUANGWA VALLEY.

MILNER-GULLAND, E J LEADER-WILLIAMS, N Illegal exploitation of wildlife.
IN: SWANSON, T M & BARBIER, E B. Economics for the wilds: wildlife, wildlands, diversity and development.
1992. 195-213, illus. London: Earthscan Publications Ltd.
CONSERVATION; POACHING.

*MONKS, E Now the rhino is on the way out in Kenya.
Africana, 6, 1977. 21.
KENYA; HORN.

*MOSELEY, R Of rhinos, elephants, poachers and war.
Chicago Tribune Magazine, 1980. 16-24.
HORN.

*PENNY, M Rhinos; endangered species.
1987. 116pp. London: Christopher Helm.
BOOKS; HORN.

*PITMAN, D TATHAM, G Rhino poaching, Zimbabwe.
Pachyderm, 5, 1985. 14-15.
ZIMBABWE.

*RICCIUTI, E R Perspective; the disappearing rhino.
Animal Kingdom, 83 (1), 1980. 56-57.
HORN.

ROBINSON, S Saving the rhino; Zambia's fight against big-time poaching.
Black Lechwe, 1, 1981. 7-11.
CONSERVATION; POACHING; ZAMBIA; ECOLOGY; POPULATIONS.

*SCHENKEL, R *SCHENKEL-HULLIGER, L Nashorner vorn Aussterben bedrocht.
Umschau in Wissenschaft und Technik, 69(23), 1969. 760-763.
BEHAVIOUR.

*SWYNNERTON, G H Threat to black rhino in East Africa.
Wildlife Nairobi, 1(1), 1959. 14-16.
EAST AFRICA.

*TATHAM, G Rhino poaching in the Zambezi Valley.
Pachyderm, 7, 1986. 3.
POACHING; ZAMBEZI VALLEY.

*TRAVASSOS SANTOS DIAS, J A A proposito do extinto rhinoceronte do Maputo. Cause e concequencias da sua desaparicao Mozambique, 105, 1961. 14-24.
MOZAMBIQUE.

TUDGE, C Can we end rhino poaching?.
New Scientist, 132 (1789), 1991. 34-39.
POACHING.

WAIT A Ninety percent of Africa's black rhino slaughtered.
Custos, 17(8), Nov 1988. 22-24.
POACHING.

WAIT, A Renosterslagting nie gestuit.
Custos, 17(8), Nov 1988. 25.
POACHING.

WALLACE, C P Waging war on Kenya's poachers.
International Wildlife, 6(5), 1981. 4-11.
CONSERVATION; POACHING; MANAGEMENT; KENYA; MERU NATIONAL PARK.

WESTERN, D Patterns of depletion in a Kenya rhino Diceros bicornis population and the conservation implications.
Biological Conservation, 24(2), 1982. 147-156.
POPULATIONS; HORN.
The Amboseli black rhino population has been monitored closely over 13 yr and its decline to near extinction levels parallels its fate elsewhere. The patterns and causes of decline are attributed directly to human agencies, initially resulting from changing social and political circumstances amongst pastoralists, recently due to poaching for horns. The general conservation implications are discussed and the need to contain the international trade in horns is considered the overriding priority, due to the difficulty and expense of eliminating poaching. 230.

POPULATIONS

*BIGALKE, R C Report on population structure of black rhino in the Hluhluwe Game Reserve.
Natal Parks Board Zoological Report, 5, 1965.
HLUHLUWE GAME RESERVE; ECOLOGY.

*BIGALKE, R C Report on the population structure of black rhino in the Hluhluwe Game Reserve.
Natal Parks Board Zoological Report, 21, 1966. 3.
HLUHLUWE GAME RESERVE; ECOLOGY.

*BORNER, M MBANO, B The use of correction factors in estimating rhino populations. Pg. 184. IN: CUMMING, D H M and Jackson, P (Eds). The status and conservation of Africa's elephants and rhinos.
Proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, Hwange, 1981.
POACHING; HORN; ECOLOGY; DISTRIBUTION.

*BOURLIERE, F Densities and biomasses of some ungulate populations in Eastern Congo and Rwanda, with notes on population structure and lion/ungulate ratios.
Zoologica Africana, 1(1), 1965. 199-207.
DISTRIBUTION; EASTERN CONGO; RWANDA; POPULATIONS.

*BROOKS, P M Summary of Hitchins draft: The population trend in the black rhinoceros in the Central Complex with particular reference to the population in Hluhluwe Game reserve and northern Corridor, 1961-1972.
Natal Parks Board Zoological Report, 49, 1975. 4.
ECOLOGY; HLUHLUWE GAME RESERVE.

*BROOKS, P M WHATELEY, A ANDERSON, J L The population composition of the black rhinoceros in the central Complex in 1980, with implications for the long-term viability of the population if densities are not reduced.
Natal Parks Board Internal Report, 1980. 6.
MANAGEMENT; ECOLOGY; NATAL.

*BROOKS, P M The population trend in the black rhinoceros in the central Complex between 1972 and 1977.
Natal Parks Board Zoological Report, 1979. 4.
ECOLOGY; NATAL.

FRAME, G W Black rhinoceros Diceros bicornis sub population on the Serengeti plains Tanzania.
African Journal of Ecology, 18(2-3), 1980. 155-166.
DESCRIPTION; SERENGETI; MANAGEMENT.
Black rhinoceroses on the Serengeti Plains were surveyed from Feb. 1974-Jan. 1978. Sex and age composition of the 67 individuals identified was 30% adult males, 36% adult females and 34% immatures and calves. Social groupings were described for 140 sightings (237 rhinos), of which 38% were lone males. The sex ratio was 1:1 for all age classes combined. Of the adult females, 79% had calves. Two observed calving intervals were approximately 3.3 yr. The ratio of adult females to young is not significantly different from ratios reported elsewhere in East Africa. Rhinos did not use the short grasslands of the Serengeti Plains. In the medium grasslands they used mainly the drainage lines where there was food and water, but only minimal cover. Most rhinos on the plains were found along the woodland edge. Near the Seronera River, on the edge of the plains, there was a density of 1 rhino/19 km2. Home ranges varied from 43-133 km2, with much overlapping. Some male, female and male-female dyads shared the same home ranges. An estimated 700 black rhinos live within the 12,290 km2 Serengeti National Park. Management for black rhinos in the park requires primarily that woodlands and abundant watering places be maintained and that poaching be minimized. 268.

*GROBLER, J H JONES, M A Population growth, standing crop and carrying capacity of large ungulates in the Whovi wild area of the Rhodes Matopos National Park.
Rhodesia Science News, 12(8), 1978. 190-192.
ECOLOGY; RHODES MATOPOS NATIONAL PARK.

*HITCHINS, P M *BROOKS, P M Preliminary report on the population size and trend (1973-1985) of the black rhinoceros in the Hluhluwe and Umfolozi game reserves, 1985.
1986. 10. Natal Parks Board.
POPULATIONS; STATUS; HLUHLUWE GAME RESERVE; UMFOLOZI GAME RESERVE.

*HITCHINS, P M Report on the population structure of black rhino in the Hluhluwe Game Reserve.
Natal Parks Board Zoological Report, 33, 1967. 5.
ECOLOGY; HLUHLUWE GAME RESERVE.

KIWIA, H D Black rhinoceros Diceros bicornis L. Population size and structure in Ngorongoro Crater Tanzania.
African Journal of Ecology, 27(1), 1989. 1-6.
NGORONGORO CRATER; DEMOGRAPHY.
A study on the black rhinoceros population in Ngorongoro Crater, Tanzania, was carried out from December 1980 to May 1982 and, later, for three weeks in September 1982. The total population size, determined by recognition of individual rhinos, was twenty-five and the density was 0.08 km-2. Although the population size has declined by 77% since 1966, the population structure has not changed significantly. The sex ratio was 1:1.cntdot.2 for all age classes combined and 1:1.cntdot.8 for adults. The former value did not differ significantly from those of ten other studies in Tanzania and Kenya. In addition, a cow:calf ratio of 100:45 showed no difference from four other studies in Tanzania and Kenya. The birth rate was 13.6% and the mortality rate was 8%. 125.

KLOS, H G FRESE, R Population trends in African rhinoceroses Diceros bicornis and Ceratotherium simum living in zoos and safari parks.
International Zoo Yearbook, 18, 1978. 231-234.
POPULATIONS; ZOOS; GAME PARKS.

LINDEMANN, H Demographic survey of the black rhinoceros Diceros bicornis in captivity.
International Zoo Yearbook, 23, 1984. 225-233.
POPULATIONS; ZOOS; BREEDING.

SHORTER, C Wrong rhino figures.
Africana, 7(1), 1979. 12.
ECOLOGY; POPULATIONS; KENYA; SAMBURU ISIOLO GAME RESERVE.

RADIO-TELEMETRY

*ANDERSON, F HITCHINS, P M A radio tracking system for the black rhinoceros.
Journal of the Southern African Wildlife Management Association, 1 (1), 1971. 26-35.
MANAGEMENT.

*ANON Black rhinos tracked by radio.
Science Journal, 6 (4), 1970. 12-13.
DISTRIBUTION; MANAGEMENT.

*HITCHINS, P M Preliminary findings in a radio telemetric study of the black rhinoceros in Hluhluwe game reserve, Zululand.
Symposium on Bioelemetry, 1971, Pretoria, 1971. 1-15, 95-100.
HLUHLUWE GAME RESERVE; BEHAVIOUR.

OWEN-SMITH, R N Minisender decken Verhalten von Nashornern auf.
Umschau in Wissenschaft und Technik, 74, 1974. 119-120.
MANAGEMENT; RADIO TRANSMITTERS.

OWEN-SMITH, R N The contribution of radio-telemetry to a study of the white rhinoceros.
Symposium on Biotelemetry, 1972, Pretoria, CSIR, 1972.
MANAGEMENT.

PIENAAR, D J HALL MARTIN, A J Radio transmitter implants in the horns of both the white and black rhinoceros in the Kruger National Park South Africa.
Koedoe, 34(2), 1991. 89-96.
HORN; KRUGER NATIONAL PARK; RADIO TRANSMITTERS.
The procedure for implanting radio transmitters into the horns of white and black rhinoceroses is described. Mean transmitter life in the white, rhinoceros was 13,9 months which is significantly longer than the 9,7 months in black rhinoceros. In the white rhinoceros a significant sex-related differences in transmitter life was found with the transmitters in males lasting a mean of 12,1 months compared to the 15,3 months in females. 27.

*STEWART, J Radio controlled rhinos.
Morgans World, 59(2), 1971. 9-12.
MANAGEMENT; RADIO TRANSMITTERS.

THOMSON, P J Rhino collars in research.
Wild Rhodesia, 5, 1974. 13.
MANAGEMENT.

REPRODUCTION

ADAMS, G P PLOTKA, E D ASA, C S GINTHER, O J Feasibility of characterizing reproductive events in large nondomestic species by transrectal ultrasonic imaging.
Zoo Biology, 10(3), 1991. 247-260.
REPRODUCTIVE TRACT; ULTRASONOGRAPHY; OVARIES; PREGNANCY; EMBRYONIC LOSS; FERTILISATION.
The feasibility of using transrectal ultrasonography for imaging the in situ morphology of the reproductive tract of females of several large nondomestic and endangered species was studied. Two black (Diceros bicornis) and 1 white (Diceros simus) rhinoceros, 2 Asian (Elaphus maximus) and 2 African (Loxodonta africana) elephants, 4 banteng (Bos javanicus), 1 guar (Bos taurus), 1 giraffe (Giraffa camelopardalis), and 1 bactrian camel (Camelus bactrianus) were examined. Real-time ultrasonic images were obtained for the following structures: 1) rhinoceros - corpus luteum, ovarian follicles, uterus, cervix, and early conceptus, 2) elephants - posterior uterus and cervix, 3) banteng and gaur - corpus luteum, ovarian follicles, uterus, cervix, and conceptus, 4) giraffe - posterior uterus, placentomes, and late conceptus, 5) camel - posterior uterus, fetal fluids, and fetal membranes. Individual ovarian follicles were identified and monitored over a 34 day observational period in 1 nontranquilized white rhinoceros. Difficulties and limitations in viewing the ovaries in the elephants were attributed to operator inexperience and to the size, positioning, and demeanor of the animals. Pregnancy was detected in 1 black rhinoceros (27 days), 1 banteng cow (48 days), the giraffe (13 months), and in the bactrian camel (approximately 31/2 months). Impending embryonic loss was suspected in the banteng cow because a heartbeat was not detected in the embryo proper; the cow was subsequently diagnosed nonpregnant by transrectal palpation 20 days later. It is concluded that the ability afforded by transrectal ultrasonography to detect and measure ovarian structures and changes in morphology of the tubular genitalia and conceptus provides a research methodology for the elucidation of certain aspects of reproductive biology, and a clinical modality for reproductive management and assisted fertilization programs of large nondomestic species. 53.

ANON Aussies to try for test-tube rhinos.
Pretoria News, 20 April 1994.
AUSTRALIA; IN VITRO FERTILISATION.

ANON Die dratyd van die breelip-of witrenoster.
Newsletter of the Department of Nature Conservation, 66, 1968. 4.
GESTATION; PREGNANCY.

*ASDELL, S A Patterns of mammalian reproduction.
2nd ed. 1964. 670. London: Constable.
REPRODUCTION.

BERTSCHINGER, H J Reproduction in black and white rhinos; a review.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 155-161 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
REPRODUCTION.

BLASDEL, T L GOEN, T OLSEN, T S CONNORS, J H FARNE, L A FLANAGAN, J P DENSMORE, M A LOSKUTOFF, N L CAPP, J Captive management of the white rhinoceros for reproductive studies IN: Conference on ungulate behavior and management, College Station,Texas, USA, May 23-27, 1988.
Applied Animal Behaviour Science, 29(1-4), 1991. 514.
CAPTIVE CARE; BEHAVIOUR; HABITAT; ZOOS.

BLASDEL, T L GOEN, T OLSEN, T S FARNE, L A CONNORS, J H FLANAGAN, J P Captive management of the white rhinoceros for reproductive studies or shifting rhinos on a shoestring.
Proceedings of the American Association of Zoological Parks and Aquariums Regional Conference, 1988. 367-373.
MANAGEMENT.

BLASDEL, T L GOEN, T OLSEN, T S FARNE, L A CONNERS, J H LURTY, R DENSMORE, M A LOSKUTOFF, N KAPP, J FULLER, D KRAEMER, D C Research on the reproduction of captive white rhinoceroses.
Proceedings of SAVMA Symposium, 1990. 182-187.
REPRODUCTION.

BLASZKIEWITZ, B Anmerkungen zu Lebensalter und Reproduktionsrate Berliner Nashorner.
International Studbook for African Rhinoceroses, 4, 1991. 37-43.
AGE.

BLUMER, E S Real world applications of reproductive technologies in the management of endangered species.
AAZPA (American Association of Zoological Parks and Aquariums) Annual Conference Proceedings, 1990, 1990. 514-519.
REPRODUCTION.

BRETT, R A HODGES, J K WANIOHI, E Assessment of reproductive status of the black rhinoceros Diceros bicornis in the wild, IN: JEWELL P A and G M O MALOIY (Ed). Symposia of the Zoological Society of London, no.61. The biology of large African mammals in their environment.
Symposium, London, England, UK, May 19-20, 1988, 1989. 147-162.
XXVIII+304pp, illus, maps. ISBN 0-19-854009-4. New York, USA: Oxford University Press.
GENETICS; BREEDING; OESTRUS; PREGNANCY.

#DRESSER, B Reproductive research update.
Pachyderm, 9, 1987. 22-26.
REPRODUCTION.

FAIRALL, N The reproductive seasons of some mammals in the Kruger National Park.
Zoologica Africana, 3, 1968. 189-210.
KRUGER NATIONAL PARK.

FRANCKE, R SCHWARZENBERGER, F GOLTENBOTH, R KLOS, H G Diagnosis of reproductive cycle and pregnancy by progesterone detection in the feces of black rhinoceroses Diceros bicornis at the zoological garden of Berlin. IN: 24th Annual meeting on reproductive physiology and pathology and the 16th joint Veterinary and Human Medical meeting, Leipzig, Germany, February 21-22, 1991.
Reproduction in Domestic Animals, 26(4), 1991. 190-191.
PREGNANCY; GERMANY; ZOOS.

GODFREY, R W POPE, C E DRESSER, B L BAVISTER, B D ANDREWS, J C OLSEN, J H An attempt to superovulate a southern white rhinoceros Ceratotherium simum simum. IN: Annual Conference of the International embryo transfer Society, Denver, Colorado, USA, January 14-16, 1990.
Theriogenology, 33(1), 1990. 231.
OVULATION; HORMONES; DRUGS; FERTILITY; BREEDING; EMBRYO TRANSFER; IN-VITRO FERTILISATION; BEHAVIOUR.

GODFREY, R W SRIVASTAVA, L RUSSELL, P T DRESSER, B L Progress in reproductive physiology research in rhinoceros. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA. 1993. i-v, 1-368. 149-152, illus. San Diego: Zoological Society of San Diego.
REPRODUCTION; ENDOCRINOLOGY.

#GOLTENBOTH, R Zyklen- und Trachtigkeitsdiagnose durch kotanalyse beim Spitzmaulnasborn (Diceros bicornis), ind. Elefanten und Okapi (Cycle and pregnancy diagnosis by excrement analysis in black rhinoceroses, Indian elephants and okapi.
VAZ, 10, 1990. 25-27.
PREGNANCY.

HAYSSEN, V VAN TIENHOVEN, A Order Perissodactyla, Family Rhinocerotidae. IN: Asdell's Patterns of Mammalian Reproduction.
1993. 369-372. Ithaca: Cornell University Press.
REPRODUCTION.

HEARNE, J P BAUERS, K ABBOTT, D H Regulation of fertility in wild mammals and man.
Proceedings of the American Association of Zoological Parks and Aquariums, 1991. 72-79.
FERTILITY.

HINDLE, J E COULSON, W F HONOUR, J W HODGES, J K Comparative aspects of progesterone metabolism in the rhinoceros.
Journal of Reproduction and Fertility, Ser.1, 1988. Abstract 78.
PROGESTERONE.

HINDLE, J E MOSTL, E HODGES, J K Measurement of urinary oestrogens and 20-alpha dihydroprogesterone during ovarian cycles of black Diceros bicornis and white Ceratotherium simum rhinoceroses.
Journal of Reproduction and Fertility, 94(1), 1992. 237-249.
OESTRAGEN; ENZYME IMMUNOASSAY.
The development of a sensitive enzyme-immunoassay for 20.alpha. -dihydroprogesterone (20.alpha.-DHP) and its use in determining reproductive status in black and white rhinoceroses is reported. 20.alpha.-DHP in hydrolysed urine diluted in parallel to standards, and high-performance liquid chromatography (HPLC) confirmed the presence of 20.alpha.-DHP and the absence of pregnanediol-3.alpha.-glucuronide (PdG) in urine collected from rhinoceroses after oestrus. Conjugated oestrone was identified by HPLC as the major urinary oestrogen in the black rhineroceros and conjugated oestradiol-17. beta. was the most abundant in the white rhinoceros. In African species, the black (Diceros bicornis), and northern (Ceratotherium simum cottoni) and southern (Ceratotherium simum simum) white rhinoceroses, excretion of 20.alpha. -DHP and oestrogen followed a cycle pattern. Excretion of 20.alpha.-DHP was low before mating, at the time of peak oestrogen excretion, but high after oestrus. In the black rhinoceros, the follicular phase was 3-4 days and the luteal phase was 18 days, suggesting a cycle of 21-22 days. The interoestrus interval in the northern subspecies of white rhinoceros was 25 days, which correlated well with the interval between peaks of oestradiol-17.beta. excretion. The interval between urinary oestrogen peaks in the southern subspecies of white rhinoceros suggested a cycle length of 32 days. This paper provides the first description of the pattern of excretion of urinary oestrogens and progesterone metabolites in African rhinoceroses. 30.

HINDLE, J E HODGES, J K Metabolism of estradiol-17-beta and progesterone in the white rhinoceros Ceratotherium simum simum.
Journal of Reproduction and Fertility, 90(2), 1990. 571-580.
PROGESTERONE.
14C-Labelled oestradiol-17.beta. and progesterone (50 .mu.Ci each) were injected i.v. into an adult female white rhinoceros and all urine and faeces collected separately over the next 4 days. The total recovery of injected label was 61%, 25% being present in the urine and 36% in the faeces. Of the radioactivity recovered, 69% was excreted on Day 2 of the collection period. Repeated extraction of samples obtained on Day 2 showed that, of the radioactivity in faeces, 92.4% was associated with unconjugated steroids whereas in the urine the proportion of conjugated an unconjugated steroids were similar (41.2% and 51.4% respectively). After phenolic separation of urinary steroids, HPLC followed by derivatization and recrystallization techniques identified progesterone as the major component of the unconjugated portion with 4-pregnen 20.alpha.-ol-3-one as the principal metabolite in the conjugated fraction. Pregnanediol was not present. Oestrone appeared to be the most abundant oestrogen metabolite with smaller but significant amounts of oestradiol-17.beta. and oestradiol-17.alpha. in the unconjugated and conjugated fractions respectively. Small amounts of progesterone were found in the faecal extract in which the radioactivity consisted mainly of oestradiol-17.alpha. and oestradiol-17.beta.. The results have established the major excreted metabolites of oestradiol-17.beta. and progesterone in the white rhinoceros and the development of more appropriate assay methods for monitoring ovarian function in African rhinoceroses should now be possible. 73.

HINDLE, J E VAHALA, I HODGES, J K Recent advances in reproductive monitoring of rhinos in captivity and in the wild. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 141-148, illus. San Diego: Zoological Society of San Diego.
REPRODUCTION; HORMONES; ENDOCRINOLOGY; PREGNANCY; OESTROUS CYCLE.

HODGES, J K GREEN, D I The development of an enzyme immunoassay for urinary pregnanediol-3- glucuronide and its application to reproductive assessment in exotic mammals.
Journal of Zoology, 219(1), 1989. 89-99, illus.
HORMONES; PREGNANCY; OVARIAN CYCLE.

#HOWARD, J G BUSH, M COLLY, L DE VOS, V WILDT, D E Electroejaculation techniques and semen evaluation in rhinoceroses.
Proceedings of the American Association of Zoo Veterinarians, 1983. 74-75.
SEMEN.

KOCK, N MORTON, D KOCK, M Reproductive parameters in free-ranging female black rhinoceroses Diceros bicornis in Zimbabwe.
Onderstepoort Journal of Veterinary Research, 58(1), 1991. 55-57.
HORMONES; ESTROUS CYCLE; PREGNANCY; AGEMENT.
Samples and data were collected from twenty-eight female black rhinoceroses (Diceros icornis) during translocation efforts carried out by the Department of National Parks and Wildlife Management in Zimbabwe. Biological data were collected, cytological examination of vaginal smears was performed, and serum concentrations of follicle stimulating hormone, luteinizing hormone, progesterone, oestriol, and 17-.beta.-oestradiol were determined by radio-immuno-assay. Prolactin levels were determined for 3 pregnant animals, 1 of which was sampled before and after parturition. Vaginal cytology was not found to be helpful for indicating the oestrous cycle stage for the black rhinoceros, but progesterone and 17-.beta.-oestradiol levels were fo und to be useful indicators of pregnancy and possibly of oestrous cycle stage as well. 51.

KUNKEL, R La sua vita e apresa a un corno.
Nat Oggi, 4(2), 1986. 42-51.
ECONOMICS; TRADE; REPRODUCTION.
ITALIAN.

*MARUSKA, E J DRESSER, B L BARDEN, B D Black rhinoceros husbandry, reproduction, health survey results.
1986, 95pp. Cincinnati: AAZPA Species Survival Plan.
AGE; TEETH; BEHAVIOUR; PHYSIOLOGY; IMMOBILISATION/DRUGS.

#MORRIS, D JARVIS, C Mammalian gestation periods.
International Zoo Yearbook, 1, 1960. 159-160.
GESTATION.

PITTENGER, W R Detecting estrus in the black rhinoceros at the Columbus Zoo.
Animal Keepers Forum, 1988. 308-315.
ZOOS; OESTRUS.

PLATZ, C C SEAGER, S W J BUSH, M Collection and analysis of semen from a black rhinoceros.
Journal of the American Veterinary Medical Association, 175(9), 1979. 1002-1004; 4 ref.
SEMEN.

RAMSAY, C Reproductive biology of female African rhinoceros.
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 17-20. Pretoria: South African Veterinary Association Wildlife Group.
REPRODUCTION.

#RAMSAY, E C KASMAN, L LASLEY, B L Urinary steroid evaluations for monitoring ovarian function in Indian and black rhinoceroses.
Proceedings of the American Association of Zoo Veterinarians, 1985, 1985. 1.
OVARIES.

RAMSAY, E C MORNA, F ROSER, J F LASLEY, B L Urinary steroid evaluations to monitor ovarian function in exotic ungulates; X. Pregnancy diagnosis in Perissodactyla.
Zoo Biology, 13, 1994. 129-147.
PREGNANCY.

RAMSAY, E C KASMAN, L H LASLEY, B L Urinary steroid evaluations to monitor ovarian function in exotic ungulates: 5. Estrogen and pregnanediol-3-glucuronide excretion in the black rhinoceros (Diceros bicornis).
Zoo Biology, 6(4), 1987. 275-282, illus.
HORMONES; OVARIES.

ROBBIBARO, K Methods of determining estrus in a white rhinoceros (Ceratotherium simum).
Animal Keepers Forum, 12 (12), 1985. 251-254.
OESTRUS.

SCHAFFER, N BEEHLER, B Overview of procedures and results of semen collection from ambulatory rhinoceroses.
Proceedings of the American Association of Zoological Parks and Aquariums, 1988. 273-279.
SEMEN.

SCHAURTE, W T On the birth of a square lipped rhino Ceratotherium simum simum in the Krugersdorp Game Reserve in Transvaal South Africa.
Säugetierkundliche Mitteilungen (Mammalogical Informations), 17(2), 1969. 158-160.
BIRTH; KRUGERSDORP GAME RESERVE.

SCHWARZENBERGER, F FRANCKE, R GOLTENBOTH, R Concentrations of faecal immunoreactive progestagen metabolites during the oestrus cycle and pregnancy in the black rhinoceros (Diceros bicornis michaeli).
Journal of Reproduction and Fertility, 98(1), May 1993. 285-291, illus.
PREGNANCY; OESTROUS CYCLE.

SEAGER, S W J WILDT, D E PLATZ, C C Semen collection and freezing in selected endangered captive wild animals.
Cryobiology, 15(6), 1978. 686-687.
SEMEN.

SMITH, R L READ B Management parameters affecting the reproductive potential of captive female black rhinoceros Diceros bicornis.
Zoo Biology, 1(6), 1992. 375-383.
BIRTH; BREEDING; CAPTIVE CARE.
With deterioration of the wild population over the last two decades, captive reproduction of black rhinoceros has become a high priority for zoological gardens. Several reproductive parameters of female black rhinoceros were analyzed with data from the international studbook, and compared to data from field studies. These analyses yielded comparisons for ages of females at first calving, length of birth intervals, and span of reproductive life. The implications for rhino productivity are discussed, and some suggestions for increasing productivity are presented. 15.

WAGNER, R A The reproductive cycle of one southern white rhinoceros.
Proceedings of the American Association of Zoo Veterinarians, 1986. 14-16.
REPRODUCTIVE CYCLE.

*YOUNG, E 'n Verslag oor die versameling van saad van 'n swart renoster PH 57 MG bul (Diceros bicornis).
Journal of the South African Veterinary Medical Association, 36(3), 1965. 385-386.
BEHAVIOUR; SEMEN.

*YOUNG,E Semen extraction by manipulative technique in the black rhinoceros Diceros bicornis.
International Zoo Yearbook, 7, 1967. 166-167.
BEHAVIOUR; SEMEN.

STATUS

ANON Black rhino in SW Africa.
Oryx, 11, 1972. 313.
NAMIBIA.

*ANON Combien reste-t-il de rhinoceros noirs en Afrique?.
Terre et la Vie, 108, 1961. 159.
DISTRIBUTION.

ANON The possibility of the former occurrence of the white rhino in the Barotseland Protectorate.
African Wildlife, 13, 1959. 336.
ZAMBIA.

ANON (White rhinos).
Artis, 24(2), 1978. 67.
KENYA; STATUS.
DUTCH.

*ANSELL, W F H Addenda and corrigenda to 'Mammals of Northern Rhodesia', No.2.
The Puku, 3, 1965. 1-14.
ECOLOGY; DISTRIBUTION; BREEDING; BEHAVIOUR; ZAMBIA.

*ANSELL, W F H Further data on Northern Rhodesian ungulates.
Mammalia, 23 (3), 1959. 332-349.
ZAMBIA.

*ANSELL, W F H Mammals of Northern Rhodesia; a revised checklist with keys, notes on distribution, range maps and summaries of breeding and ecological data.
1960. 155pp. Lusaka: Government Printer.
ECOLOGY; BREEDING; DISTRIBUTION; ZAMBIA; BEHAVIOUR.

ANSELL, W F H Northern Rhodesia's protected animals.
African Wildlife, 11 (1), 1957. 19-28.
ZAMBIA.

*ANSELL, W F H The black rhinoceros in Zambia.
Black Lechwe, 11 (2), 1973. 25-35.
ZAMBIA.

*ANSELL, W F H The mammals of Zambia.
1978. 125pp. Chilanga: National Parks and Wildlife Service.
TAXONOMY; ZAMBIA.

*ANSELL, W F H The status of Northern Rhodesian game (observations on the mammals scheduled under the Game Ordinance).
African Wildlife, 6 (2), 1952. 108-117.
STATUS; ZAMBIA.

*BIGALKE, R C H On the present status of ungulate mammals in South West Africa.
Mammalia, 22, 1958. 478-497.
NAMIBIA; DISTRIBUTION.

*BORNER, M Black rhino disaster in Tanzania.
Oryx, 16(1), 1981. 59-66.
TANZANIA.

*BOTHMA, J DU P Conservation status of the larger mammals of southern Africa.
Biological Conservation, 7, 1975. 87-95.
SOUTH AFRICA.

BOURQUIN, O SOWLER, S G The vertebrates of Vernon Crookes Nature Reserve.
Lammergeyer, 28, 1980. 20-32.
VERNON CROOKES NATURE RESERVE.

*BOWDEN, M ISAACS, C Rhino-the last look?.
The Philadelphia Inquirer, 1982. 36.
STATUS; TRANSLOCATION; ECOLOGY; HORN; POACHING.

*COBB, S The rhino's last trump.
Wildlife News, 14, 1979. 10-12.
STATUS.

CORYNDON, R T Occurrence of the white or Burchell's rhinoceros in Mashonaland.
Proceedings of the Zoological Society of London, 1894. 329-334.
ZIMBABWE; MASHONALAND.

*CUMMING, D H M JACKSON, P The status and conservation of Africa's elephants and rhinos.
Proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, 1981. 191. Hwange:
GENETICS; HORN; MANAGEMENT; DISTRIBUTION; POACHING; CONSERVATION.

CUMMING, D H M JACKSON, P (EDS) The status and conservation of Africa's elephants and rhinos.
1984. i-vi, 1-195, illus. Gland: International Union for Conservation of Nature and Natural Resources.
CONSERVATION.

*DAUBERCIES, A Black rhinoceros survey 1959-1960..
Proceedings of the International Union for the Conservation of Natural Resources, 1960, 1960. 127-133.
STATUS; BEHAVIOUR; DISTRIBUTION.

DE BIE, S Is there a future for wildlife in West Africa? IN: Transactions of the 19th Congress of the International Union of Game Biologists, Trondheim, Norway, 1989. Vol.2.
1990. 655-663.
WEST AFRICA; CONSERVATION.

*DOUGLAS-HAMILTON, I Elephant and rhino population trends in Selous, Tanzania.
Pachyderm, 4, 1984. 18.
TANZANIA; SELOUS; POPULATIONS.

*EDROMA, E L White rhino extinct in Uganda.
Oryx, 16(4), 1982. 352-355.
UGANDA; EXTINCTION.

EMSLIE, R H ADCOCK, K Status history and performance of black rhinoceros Diceros bicornis populations in South Africa the Transkei Boputhatswana Venda and Ciskei states and Namibia. IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 82.
CONSERVATION; BLACK RHINO 2000; POPULATIONS; SOUTH AFRICA; NAMIBIA; CENSUSING.

FOOSE, T Rhino update.
Species (Newsletter of the Species Survival Comm), 13-14, 1990. 70.
CONSERVATION.

FOOSE T J MILLER, R E African rhinoceros populations in North America. Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 31-34 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
NORTH AMERICA; UNITED STATES; STATUS.

*FOSBROOKE, H The white rhino in Tanzania.
1975. Dodoma: UNEP.
TANZANIA; BEHAVIOUR.

*FRASER, A D On the present status of ungulates in southern Rhodesia.
Mammalia, 22, 1958. 469-475.
ZIMBABWE; DISTRIBUTION.

GAKAHU, C G African rhinos: current numbers and distribution. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 160-165, illus. San Diego: Zoological Society of San Diego.
POPULATIONS; DISTRIBUTION.

*GRIMWOOD, I R BENSON, C W ANSELL, W F H The present-day status of ungulates in Northern Rhodesia.
Mammalia, 22, 1958. 451-468.
ZAMBIA; STATUS.

*GUGGISBERG, C A W Neushoorns in Amboseli.
Artis, 12(2), 1966. 40-45.
AMBOSELI; BEHAVIOUR.

*GUGGISBERG, C A W S.O.S. Rhino.
1966. London: Andre Deutsch.
BOOKS; DISTRIBUTION; STATUS; BEHAVIOUR; TAXONOMY; HORN; MORPHOLOGY.

*HALL-MARTIN, A J Black rhinoceros in southern Africa.
Oryx, 15(1), 1979. 26-32.
STATUS; DISTRIBUTION; SOUTHERN AFRICA.

*HAVENGA, M J Black rhino for Kruger Park.
African Wildlife, 24(3), 1970. 257-258.
STATUS; BEHAVIOUR; KRUGER NATIONAL PARK.

*HAYES, C The fight to save Uganda's white rhino.
Africana, 2(1), 1964.
UGANDA; EXTINCTION.

*HILLMAN, K African rhinoceros.
World Wildlife Fund Yearbook, 1979-1980, 1980. 69-75.
STATUS.

*HILLMAN, K African rhinoceros survey and conservation.
World Wildlife Fund Yearbook, 1980-81, 1981. 309-313.
CONSERVATION.

*HILLMAN, K The status and conservation of Africa's rhinos.
Wildlife News, 15 (2), 1980. 2-5.
CONSERVATION.

*HILLMAN, K The status of northern white rhinos.
African Elephant and Rhino Group Newsletter, 1, 1983. 5-7.
STATUS.

*HITCHINS, K Black and square-lipped rhino count Hluhluwe Game Reserve north of the main Mtuba-Hlabisa road.
Natal Parks Board Zoological Report, 34, 1967. 4.
ECOLOGY; HLUHLUWE GAME RESERVE.

*HITCHINS, P M Some preliminary findings on the population structure and status of the black rhinoceros Diceros bicornis in the Hluhluwe game reserve, Zululand.
Lammergeyer, 9, 1968. 26-28.
POPULATIONS; HLUHLUWE GAME RESERVE; ZULULAND.

*HITCHINS, P M The status of the black rhinoceros, Diceros bicornis Linn. in the Zululand Game and Nature Reserves.
Proceedings of Symposium on Endangered Wildlife in Southern Africa.
Pretoria, 1976. 54-67.
ZULULAND.

JACHMAN, H [The last rhinos in Malawi.].
Dieren, 8(3), 1991. 89-94, illus.
MALAWI; POACHING; TRADE.
Dutch.

*JACHMANN, H Status of the Mwabvi rhino.
Nyala, 10 (2), 1984. 77-90.
MWABVI; ECOLOGY.

JOHNSON, R DOWARD, N DUCKETT, W BEARE, N Chete black rhino expedition to Zimbabwe.
Cambridge Expeditions Journal, 1991. 25-28, illus.
ZIMBABWE; POPULATIONS.

*JOUBERT, E Die swart renoster.
Quagga, 7, 1984. 12-15.
STATUS.

*KLOS, H FRESE, R International studbook of the black rhinoceros, 31/12/1980.
1981. 45pp. Berlin: Zoologische Garten.
STUDBOOK.

#KOCK, R A Population and veterinary status of black rhinos in the United Kingdom.
Pachyderm, 9, 1987. 29-32.
UNITED KINGDOM; POPULATIONS.

*LANG,H Threatened extinction of the white rhinoceros.
Journal of Mammalogy, 5(3), 1924. 173-180.
EXTINCTION; POACHING.

*LAWLEY, J C Some progress but concern remains about Namibia's desert rhinos and elephants.
Oryx, 20 (3), 1986. 182.
DISTRIBUTION; NAMIBIA.

*LITHGOW, T The possible extinction of rhino at the Ngorongoro Crater.
African Wildlife, 15 (2), 1961. 162-165.
NGORONGORO CRATER.

*LOUTIT, B Protecting the black rhino in Damaraland, Namibia.
Pachyderm, 4, 1984. 13-14.
NAMIBIA; DISTRIBUTION; POACHING.

LOUTIT, B The Damaraland rhino.
African Wildlife, 42(2), 1988. 66-68, illus.
POPULATIONS; POACHING; NAMIBIA.
Poaching effects on population decline and protection of endangered species.

*MACARTNEY, P Black rhino in Zambia.
Black Lechwe, 8 (3), 1970. 21.
ZAMBIA.

MAKACHA, S MOLLEL, C L RWEZAURA, J The conservation status of the black rhinoceros Diceros bicornis in the Ngorongoro Crater Tanzania.
African Journal of Ecology, 17(2), 1979. 97-104.
NGORONGORO CRATER; POACHING; CENSUSING.
A study on the conservation status of the black rhinoceros (D. bicornis, L.) in the Ngorongoro Crater, Tanzania was made to investigate recent allegations that this species is fast disappearing in the area. Comparison of census data on rhinos were made from 1958-1978 during which time there has been a notable steady decline in the mean population density mainly due to increased poaching pressure. Other factors that may have caused this fall are discussed. Urgent management measures to conserve the rhino population in the Ngorongoro Crater and the surrounding areas are recommended. 262.

MANKOTO, M O La situation des rhinoceros blancs (Ceratotherium simum cottoni) au parc national de la Garamba (Zaire).
Cahiers d'Ethologie Appliquee, 8(3), 1988. 450-456, illus.
POPULATIONS; CONSERVATION; ZAIRE; GARAMBA NATIONAL PARK.
French.

MANN, P Elephants et rhinoceros en Zambie. Le crepuscule des mastodontes..
Courrier de la Nature, 107, 1987. 32-37, illus.
ZAMBIA.
French.

MARUSKA, E J Status of the black rhino in the wild and in captivity.
Proceedings of the American Association of Zoological Parks and Aquariums, 1982, 1982. 27-30.
CONSERVATION.

*MONKS, E Rhino: historical survey and present status.
Africana, 6 (10), 1978. 23-25.
STATUS.

MWALYOSI, R B B A count of large mammals in Lake Manyara National Park.
East African Wildlife Journal, 15(4), 1977. 333-336.
TANZANIA; LAKE MANYARA NATIONAL PARK; POPULATIONS; DISTRIBUTION; CENSUSING.
Aerial and ground counts were conducted of 7 large mammals: elephant (Loxodonta africana), buffalo (Syncerus caffer), hippopotamus (Hippopotamus amphibius), zebra (Equus burchelli), rhinoceros (Diceros bicornis), giraffe (Giraffa camelopardalis) and impala (Aepyceros melampus) on Oct. 3, 1975 in Tanzania. Changes in climate, especially rainfall, had a great impact on the flora of the Park which was advantageous to the animal populations, especially the plains game. The immediate future of the large mammal populations in the Park looked assured with the availability of a southern extension and improved access to the Marang forest provided that the lake does not completely dry up. 297.

*PARKER, I S C Black rhinoceros and other large mammals in Mwabvi game reserve.
Report to the Malawi government, 44, 1976.
MWABVI GAME RESERVE.

*PIENAAR, U DE V The large mammals of the Kruger National Park: their distribution and present-day status.
Koedoe, 6, 1963. 1-37.
DISTRIBUTION; KRUGER NATIONAL PARK.

*PLAYER, I C *FEELY, J M A preliminary report on the square-lipped rhinoceros Ceratotherium simum simum.
Lammergeyer, 1(1), 1960. 3-24.
STATUS.

POTTER, D Update on current situation of rhinos in Natal.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
CONSERVATION; NATAL.

*RAUTENBACH, I L Observations on mammals of the Eastern Caprivi strip.
Transvaal Museum Bulletin, 11, 1971. 5-6.
EASTERN CAPRIVI.

*ROTH, H H The present situation of the rhinoceros.
World Wildlife Fund Yearbook, 1969, 1969. 307-311.
STATUS.

*SIMON, N The status of species: black rhinoceros.
Between the Sunlight and the Thunder, 1962. 254-258. London and Glasgow: Collins.
STATUS.

*SIMON, N M Red Data Book I: Mammalia.
1966-1971. Morges: IUCN.
STATUS.

*SKEAD, C J Historical mammal incidence in the Cape province.
1, 1980. 277-311. Cape Town: Department of Nature and Environmental Conservation of the Provicial Administration of the Cape of Good Hope.
CAPE PROVINCE.

*SMITHERS, R H N A check list and atlas of the mammals of Botswana(Africa).
1968. 169. Salisbury: Trustees of the National Museum of Rhodesia.
STATUS; BOTSWANA.

*SMITHERS, R H N *WILSON, V J Check list and atlas of the mammals of Zimbabwe Rhodesia.
Salisbury Trustees of the National Museums and Monuments of Rhodesia Museum Memoir, 9, 1979. 111-112.
STATUS; ZIMBABWE.

*SMITHERS, R H N *TELLO, J L P L Check list and atlas of the mammals of Mozambique.
1976. 184. Salisbury: Trustees of the National Museums and Monuments of Rhodesia.
STATUS; MOZAMBIQUE.

*SMITHERS, R H N South African Red Data Book - Terrestrial mammals.
South African National Scientific Programmes Report, 125, 1986. 88-92. Pretoria: CSIR.
STATUS.

*SOUTH AFRICAN NATIONAL PARKS BOARD South Africa: Report of the National Parks Board of Trustees for the year 1936.
Journal of the Society for the Preservation of the Wild Fauna of the Empire, 32, 1937. 20-22.
STATUS.

*SPINAGE, C A The rhinos of the Central African Republic.
Pachyderm, 6, 1986. 10-13.
BEHAVIOUR; CENTRAL AFRICAN REPUBLIC.

*STELFOX, J G *KUFWAFWA, J W *OTTICHILO, W K Monitoring elephant and rhino trends in Kenya.
Pachyderm, 4, 1984. 15.
BEHAVIOUR; STATUS; KENYA.

SWEENEY, R C H A preliminary annotated check list of the mammals of Nyassaland.
1959. Blantyre: The Nyassaland Society.
MALAWI.

*THORNBACK, L J Northern square-lipped rhino.
IUCN Red Data Book, 1981. 1-4.
STATUS.

*VINCENT, J Rhino and game counts HGR/Corridor/UGR Complex.
National Parks Board Report, 2, 1969.
DISTRIBUTION; NATAL; STATUS.

VINCENT, J The status of the square-lipped rhinoceros Ceratotherium simum simum in Zululand.
Lammergeyer, (10), 1969. 12-21.
ZULULAND; CENSUSING.

WALKER, C H Rhinos in Africa - the present situation.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 1-3 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
STATUS.

*WAWERU, F The status of the black rhinos in Nairobi National Park.
Swara, 9(4), 1986. 33.
NAIROBI NATIONAL PARK; STATUS.

WESTERN, D Africa's elephants and rhinos: flagships in crisis.
Trends in Ecology and Evolution, 2(11), 1987. 343-346, illus.
CONSERVATION.

WESTERN, D Editorial comment.
Swara, 8(2), 1985. 7, illus.
CONSERVATION.

WESTERN, D Monitoring Africa's megafauna.
Animal Kingdom, 88(3), 1985. 30-34, illus.
CONSERVATION; POPULATIONS.

WESTERN, D VIGNE, L The deteriorating status of African rhinos.
Oryx, 19(4), 1985. 215-220, illus.
POACHING; POPULATIONS.

WESTERN, D VIGNE, L The status of rhinos in Africa.
SWARA, 8(2), 1985. 10-12, illus.
POPULATIONS; TRADE; POACHING.

TAXONOMY

*ANSELL, W F H Perissodactyla. IN: MEESTER, J and SETZER, H W (Eds). The Mammals of Africa; an identification manual.
Part 14, 1967. 1-26. Washington, D.C.: Smithsonian Institution Press.
TAXONOMY.

*ELLERMAN, J R Die taksonomie van die soogdiere van die Unie van Suid-Afrika.
Annale van die Universiteit van Stellenbosch, 30(1), 1954. 1-125.
DISTRIBUTION.

GROVES, C P Taxonomic notes on the white rhinoceros Ceratotherium simum.
Säugetierkundliche Mitteilungen (Mammalogical Informations), 23(3), 1975. 200-212.
ANATOMY; SKULL; TEETH; BODY SIZE; HAIR; SKELETON.

GROVES, C P Testing rhinoceros subspecies by multivariate analysis. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 92-100, illus. San Diego: Zoological Society of San Diego.
BIOMETRICS; SKULL ; EVOLUTION.

JOUBERT, E The taxonomic status of the black rhinoceros Diceros bicornis in South West Africa.
Madoqua, (2), 1970. 27-37.
SKULL; NAMIBIA; ANATOMY.

*MEESTER, J A J RAUTENBACH, I L DIPPENAAR, N J BAKER, C M Classification of southern African mammals.
Transvaal Museum Monograph, 5, 1986. 172-173.
TAXONOMY.

ROOKMAAKER, L C Historical notes on the taxonomy and nomenclature of the recent Rhinocerotidae Mammalia Perissodactyla.
Beaufortia, 33(4), 1983. 37-51.
TAXONOMY.
The historical background of 16 taxa in the family Rhinocerotidae is examined to assess their types and present status. Treated are various taxonomic or nomenclatorial aspects of the following specific names: Rhinoceros africanus, R. annamiticus, R. asiaticus, R. brucii, R. camperi, R. camperii, R. camperis, R. bicornis capensis, R. cucullatus, R. gordoni, R. inermis, R. jamrachi, R. javanicus, R. javanus, R. sondaicus and R. sumatrensis. A short discussion on the definition of iconotype is added.
215.

ROOKMAAKER, L C GROVES, C P The extinct Cape rhinoceros, Diceros bicornis bicornis Linnaeus, 1758).
Säugetierkundliche Mitteilungen , 26(2), 1978. 117-126.
SOUTH AFRICA.

TEETH

*ANDERSON, J L Tooth replacement and dentition of the black rhinoceros (Diceros bicornis Linn).
Lammergeyer, 6, 1966. 41-46.
AGE; ANATOMY.

CHRISTODOULIDES, C FREMLIN, J H Thermo luminescence of biological materials.
Nature, 232(5308), 1971. 257-258.
TEETH; DATING TECHNIQUE.

*HICKMAN, G C An inverted tooth in a white rhinoceros.
Lammergeyer, 27, 1979. 46-47.
VETERINARY MEDICINE AND SURGERY; TEETH.

SPINAGE, C A Incremental cementum lines in the teeth of tropical African mammals.
Journal of Zoology, 178(1), 1976. 117-131.
TEETH; AGE; RAINFALL.
The correlation of a series of 2 darkly-staining lines in the tooth cementum of tropical African mammals Diceros bicornis, Leo leo, Giraffa camelopardalis, Loxodonta africana, buffalo, waterbuck from areas of bimodal equatorial rainfall is briefly reviewed and contrasted with the findings in S Africa where bi-annual lines are claimed for areas of unimodal rainfall. A sample of African buffalo teeth from a unimodal rainfall area in S Tanzania was examined and the conclusion reached that, in general, one dark line per year was formed. A miscellaneous selection of mainly known age animals was also examined with various results. Anomalies in the apparent formation of cementum lines are discussed. 320.

THESES

ANSTEY, S An evaluation of WWF rhino projects, 1961-1987.
1987. MSc thesis (Conservation). London: University College of London.
THESES; WORLD WILDLIFE FUND.

BORTHWICK, M R Habitat use by the white rhinoceros in relation to other grazing ungulates in Pilanesberg Game Reserve, Bophuthatswana.
1986. MSc thesis. Johannesburg: University of the Witwatersrand.
THESES; PILANESBERG GAME RESERVE.

*COBB, S The distribution and abundance of the large herbivore community of Tsavo National Park, Kenya.
1976. 68. Ph.D. thesis.
TSAVO NATIONAL PARK; THESES; DISTRIBUTION.

*JOUBERT, E An ecological study of the black rhinoceros (Diceros bicornis Linn., 1758) in South West Africa.
1969. MSc thesis. Pretoria: University of Pretoria.
THESES; NAMIBIA.

#O'CONNOR, The behavioral ecology of the white rhinoceros at the Whipsnade Zoological Park.
1982. MPhil thesis. Cambridge: University of Cambridge.
ECOLOGY; UNITED KINGDOM; WHIPSNADE ZOOLOGICAL PARK; THESES.

*OWEN-SMITH, R N The behavioural ecology of the white rhinoceros.
1973. 786pp. Thesis. Wisconsin: University of Wisconsin.
ECOLOGY; THESES.

PIENAAR, D J The landscape preference and horn attributes of the white rhinoceros Ceratotherium simum simum (Burchell, 1817) in the Kruger National Park.
1993. MSc thesis (Wildlife Management). Pretoria: University of Pretoria.
THESES; HORN.

SCHMIDT, A G Guidelines for the management of some game ranches in the mixed Bushveld communities of the north-western Transvaal, with special reference to Rhino Ranch.
1993. MSc thesis (Wildlife Management). Pretoria: University of Pretoria.
THESES; CONSERVATION.

TICKS

*BAKER, M K KEEP, M E Checklist of the ticks found on the larger game animals in the Natal game reserves.
Lammergeyer, 12, 1970. 41-44.
ECOLOGY; TICKS.

*COLBO, M H Ticks of Zambian wild animals: a preliminary check list.
The Puku, 7, 1973. 97-105.
ECOLOGY; TICKS; ZAMBIA.

DUNCAN, I M The use of Flumethrine pour-on for de-ticking black rhinoceros Diceros bicornis prior to translocation in Zimbabwe.
Journal of the South African Veterinary Association, 60(4), 1989. 195-197.
TICKS; FLUMETHRIN.
The use of flumethrin pour-on in 1.0% and 0.5% concentrations for the purpose of de-ticking black rhinoceros (Diceros bicornis) prior to translocation is reported. Both formulations achieved a high level of efficacy within 8 to 12 h following treatment. The 0.5% formulation was found to be more suitable than the 1.0% for use on the dry, hairless skin of the rhinoceros because the increased dose volume resulted in more rapid spreading. 105.

HORAK, I G MACIVOR, K M DE F PETNEY, T N DE VOS, V Some avian and mammalian hosts of Amblyomma hebraeum and Amblyomma marmoreum (Acari: Ixodidae).
Onderstepoort Journal of Veterinary Research. 54(3), 1987. 397-403; 23 ref.
TICKS; ACARI; IXODIDAE; ECOLOGY.
Large numbers of birds, wild mammals and domestic stock from a variety of localities within South Africa were examined for infestation with A. hebraeum and A. marmoreum. Every warthog (Phacochoerus aethiopicus), Burchell's zebra (Equus burchelli), impala (Aepyceros melampus) and kudu (Tragelaphus strepsiceros) from the Kruger National Park in the north-eastern Transvaal Lowveld was infested with Amblyomma hebraeum. In the eastern Cape Province, every helmeted guineafowl (Numida meleagris), scrub hare (Lepus saxatilis) and kudu from the Andries Vosloo Kudu Reserve; all but 1 of the 22 domestic cattle examined on the farm "Bucklands"; and all Angora goats plus nearly all Boer goats on the farm "Brakhill" were infested with this tick. Most animals examined appeared to be good hosts of the immature stages, and the larger the host the greater the chances of it harbouring large numbers of adult ticks. The largest animals examined, such as eland, buffalo, giraffe and rhinoceros, harboured very large numbers of adult A. hebraeum. No adult A. marmoreum was recovered from any host. However, 50% more of helmeted guineafowl and kudu from the Andries Vosloo Kudu Reserve; helmeted guineafowl, scrub hares and eland (Taurotragus oryx [Tragelaphus oryx]) from the Mountain Zebra National Park; helmeted guineafowl, kudu, domestic sheep, goats and cattle on the farm "Bucklands", and caracal (Felis caracal) from the Cradock and Southwell areas of the eastern Cape Province were infested with immature A. marmoreum. In the Bontebok National Park in the south-western Cape Province, > 35% of scrub hares, vaal ribbok (Pelea capreolus) and bontebok (Damaliscus dorcas dorcas) were infested with immature ticks.. Africa South Africa.

MINSHULL, J I Seasonal occurrence, habitat distribution and host range of four ixodid tick species at Kyle Recreational Park in south eastern Zimbabwe.
Zimbabwe Veterinary Journal, 12(4), 1981. 58-63; 14 ref.
TICKS; IXODIDAE; ZIMBABWE.
Immature and adult stages of Hyalomma marginatum rufipes Koch, Rhipicephalus evertsi evertsi Neum., Boophilus decoloratus (Koch) and Amblyomma hebraeum Koch were collected from hosts and by drag sampling at Kyle Recreational Park, Zimbabwe, in 1975-78. Adults of H. m. rufipes occurred only on zebra (Equus burchelli) and buffalo (Syncerus caffer), during the rainy season. Larval activity in this tick species was confined to the cool season and the life-cycle of 1 generation per year was seasonally regulated. In the other 3 tick species, the life-cycles were uninterrupted, and a wide range of ungulates was parasitised. Adults of R. e. evertsi were most numerous on zebra, while those of A. hebraeum were most numerous on rhinoceros (Ceratotherium simum) and buffalo. The seasonal pattern of habitat utilisation by the hosts determined the spatial distributions of the larvae of H. m. rufipes, R. e. evertsi and B. decoloratus. The distribution of larvae of A. hebraeum was influenced by microclimatic conditions, and the larvae were most abundant in woodland habitats..

NORVAL, R A I COLBORNE, J The ticks of Zimbabwe. X. The genera Dermacentor and Rhipicentor.
Zimbabwe Veterinary Journal, 16(1/2, 1-4), 1985. 11 ref.
IXODIDAE; ACARI; ZIMBABWE.
In Zimbabwe the genus Dermacentor is represented by D. rhinocerinus and the genus Rhipicentor by R. nuttalli. In the adult stage D. rhinocerinus is a specific parasite of rhinoceroses and it occurs only in areas where these hosts are present. The main host of the adults of R. nuttalli appears to be the leopard and the tick is most common in rocky areas along the southern margins of the highveld plateau. Other mammals which inhabit these rocky areas are also parasitized. The hosts of the immature stages of both D. rhinocerinus and R. nuttalli are unknown.. Zimbabwe.

STUTTERHEIM, C J Past and present ecological distribution of the redbilled oxpecker (Buphagus erythrorhynchus) in South Africa.
South African Journal of Zoology, 17(4), 1982. 190-196; 51 ref., 4 fig.
OXPECKERS.
The South African records of the red-billed oxpecker (Buphagus erythrorhynchus) are reviewed. Its distribution is determined by the distribution of Rhipicephalus appendiculatus Neum. and Boophilus decoloratus (Koch), which form the most important component of its food. The acceptable records of the occurrence of this oxpecker and of each of these ticks are shown on maps. The ticks, of which R. appendiculatus is the species preferred by the oxpecker, occur on species of antelope, domestic cattle, buffalo and rhinoceros, and the oxpecker survives in Natal and Transvaal in game reserves, on cattle farms with large game populations and in areas with undipped cattle. The decline in its numbers in South Africa is largely attributed to the unavailability of the preferred ticks following the reduction of the wild game population and the introduction of cattle-dipping for tick control.. South-Africa.

USA, UNITED STATES DEPARTMENT OF AGRICULTURE, ANIMAL AND PLANT HEALTH INSPECTION SERVICE, VETERINARY SERVICES Ectoparasites on imported rhinoceroses.
Foreign Animal Disease Report, 17(4), 1989. 3.
ECTOPARASITES; ACARI; USA; IXODIDAE; BABESIA; THEILERIA.
On July 16th 1989, 10 black rhinoceroses [Diceros bicornis] arrived at Dallas, Texas, from South Africa via Frankfurt, Germany. They were inspected for ticks on arrival and sprayed with an approved acaricide (compound not stated). Twenty male ticks representing the species Dermacentor rhinocerinus, Amblyomma sparsum and Hyalomma truncatum were found. On August 29th 1989 the rhinos were again treated for ectoparasites. Subsequently, one rhino became icteric, depressed and reluctant to move. Blood smears and sera were taken: sera were positive for Babesia bigemina, and "possible Theileria organisms" were reported from the blood smears. Plans to collect further blood samples on September 17th 1989 were made.. Texas USA South Africa.

WILSON, D D RICHARD, R D Interception of a vector of heartwater, Amblyomma hebraeum Koch (Acari: Ixodidae) on black rhinoceroses imported into the United States.
Proceedings, Eighty-eighth Annual Meeting of the United States Animal Health Association, The Hyatt Regency Fort Worth Hotel, Fort Worth, Texas, October 21-26, 1984, 1984. 303-311; 17 ref., 1 fig. Richmond, Virginia, USA: United States Animal Health Association.
COWDRIA RUMINANTIUM; ACARI; TEXAS; ECTOPARASITES.
A total of 23 males of Amblyomma hebraeum, a vector of the rickettsia Cowdria ruminantium, was collected from 5 black rhinoceroses (Diceros bicornis) imported to the USA from South Africa in 1984. Individuals of this ixodid were not detected in a survey of the rhinoceros' pastures and pens on the ranches to which they had been sent in Texas, or on cattle, rabbits and feral pigs from the area. Males and females of 2 native American ticks, A. cajennense and A. americanum, were also found on the rhinoceroses.. South Africa USA Texas.

TRADE

ANON Taiwan develops measures to control internal trade in rhino horn.
Traffic Bulletin, 13 (1), 1992. 1.
TAIWAN; LEGISLATION; HORN.

BRADLEY MARTIN, E Taiwan and the African rhino horn trade.
SWARA, 11(6), 1988. 26-27, illus.
HORN; TAIWAN; LEGISLATION.

BRADLEY MARTIN, E The present day trade routes and markets for rhinoceros products. IN: RYDER, O A (Ed). Rhinoceros biology and conservation. Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. i-v, 1-368. 1-9, illus. San Diego: Zoological Society of San Diego.
TRADE; HORN.

KUMAR, S Taiwan accuses princess of smuggling rhino horn.
New Scientist, 140(1895), OCT 16 1993. 11, Editorial.
HORN.

LINDEMANN, H [Can the rhinoceros be saved?].
NATURENS VERDEN, 1981(1), 1981. 41-55, illus.
TRADE.
Danish.

LOH, I-CHENG The curtailment of trade in rhino products in the Republic of China.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 7-10 Pretoria: South African Veterinary Association Wildlife Group, University of Pretoria.
TRADE; TAIWAN.

MARTIN, B VIGNE, L Abetting the rhino horn trade.
Quagga, 24, 1988. 23-24.
HORN.

MARTIN, C B MARTIN, E B Correction of EARRM 40064354. Profligate spending exploits wildlife in Taiwan. Correction of issue number from 7.
Oryx, 25(1), 1991. 18-20.
HORN; WILDLIFE PROTECTION ACT.

MARTIN, E MARTIN, C B Combatting the illegal trade in rhinoceros products.
Oryx, 21(3), 1987. 143-148.
HORN; CONSERVATION.

*MARTIN, E B Follow-up to stop trade in rhino products in Asia.
African Elephant and Rhino Group Newsletter, 1, 1983. 9-11.
HORN.

MARTIN, E B RYAN, T C I How much rhino horn has come onto international markets since 1970?.
Pachyderm, 13, 1990. 20-25.
HORN.

*MARTIN, E B North Yemen and the rhino horn trade today.
Swara, 7 (2), 1984. 28-33.
NORTH YEMEN; HORN.

*MARTIN, E B North Yemen bans the importation of rhino horn.
African Elephant and Rhino Group Newsletter, 1, 1983. 14.
NORTH YEMEN; HORN.

*MARTIN, E B Rhino trade study - Japan, South Korea, Indonesia, Malaysia and Burma.
World Wildlife Fund Yearbook, 1982. 294-301.
HORN.

*MARTIN, E B Selling rhinos to extinction.
Oryx, 15 (4), 1980. 322-323.
HORN.

*MARTIN, E B The decline in the trade of rhinoceros horn.
Swara, 6 (5), 1983. 10-15.
HORN.

*MARTIN, E B The international trade in rhinoceros products.
World Wildlife Fund Yearbook, 1979-80, 1980. 75-81.
HORN.

*MARTIN, E B The Japanese and Korean trade in rhinoceros horn.
The status and conservation of Africa's elephants and rhinos; proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups. Hwange, 1981. 119-143.
JAPAN; KOREA; HORN.

MARTIN, E B MARTIN, C B The Taiwanese connection; a new peril for rhinos.
Oryx, 23 (2), 1989. 76-81.
TAIWAN.

*MARTIN, E B BARZDO, J The volume of the world's trade in rhino horn.
IUCN Wildlife Trade Monitoring Unit Traffic Bulletin, 6 (1), 1984. 3-4.
HORN.

*MARTIN, E B The Yemeni rhino horn trade.
Pachyderm, 8, 1987. 13-16.
HORN; YEMEN.

*MARTIN, E B Trade in African rhino horn.
Oryx, 15 (2), 1979. 157.
HORN.

*MARTIN, E B Trade in rhino products.
World Wildlife Fund Yearbook, 1983/84, 1984. 169-173.
HORN.

MILLIKEN, T The evolution of legal controls on rhinoceros products in Hong Kong an Asian model worth considering.
Oryx, 25(4), 1991. 209-214.
HORN; LEGISLATION.
Although commercial international trade in rhinoceros parts, products and derivatives has been prohibited under the Convention on International Trade in Endangered Species of Wild Fauna and Flora since 1977, trade within national boundaries cannot be regulated under the Convention. As a result illegal trade to supply domestic markets persists and rhinoceros populations continue to decline. Hong Kong was the first government in Asia to address this problem. Over a period of 13 years Hong Kong authorities introduced regulations progressively restricting the trade until in 1989 all aspects of the country's rhino trade became subject to legal prohibitions. Hong Kong's experience offers a valuable model for other Asian countries. 37.

*PARKER, I S C MARTIN, E B Further insights into the international ivory trade.
Oryx, 17 (4), 1983. 194-200.
HORN.

*PARKER, I S C MARTIN, E B Trade in African rhino horn.
Oryx, 15 (2), 1979. 153-158.
HORN.

*VIGNE, L North Yemen now takes one half of all rhino horn.
African Elephant and Rhino Group Newsletter, 3, 1984. 18.
HORN; NORTH YEMEN.

VIGNE, L MARTIN, E Upsurge of rhino horn imports into Yemen.
Endangered Wildlife, 12, Dec 1992. 3-6.
HORN; YEMEN.

WACHTEL, P Yemen acts to halt rhino horn daggers; scientific tests fail to show rhino horn effective as medicine.
Tigerpaper, 10(2), 1983. 24.
HORN; TRADITIONAL MEDICINE; YEMEN.

WALKER, A J Supplementary report on elephant ivory and rhino horn in Middle East markets following field visits to the Yemen Arab Republic and Dubai.
Report by IMES - consultants to Mwenge International, 1979.
YEMEN; DUBAI; HORN.

WESTERN D The undetected trade in rhino horn.
Pachyderm, 11, 1989. 26-28.
HORN.

WRIGHT, J Law enforcement pertaining to illicit trafficking in rhinoceros horn and other trophies.
Koedoe, 32(2), 1989. 77-79.
LEGISLATION; HORN.

TRADITIONAL MEDICINE

ZHANG, D Polycythemia vera 10 cases treated by herbs with blood activating and stasis dispersing actions.
Tianjin Medical Journal, 10(3), 1982. 154-157.
HORN.
Ten cases of polycythemia vera, 8 males and 2 females, aged 35-53 yr, are reported. The duration of the disease was 2-13 yr. One case had not been previously treated, one had been treated with rhinoceros horn preparation, 2 had failed to respond with Myleran busulfan treatment, 3 had been treated with 32P and 3 had been treated with blood-letting. Before treatment their Hb values were 19.8-23.0 g%. All the patients were treated with traditional Chinese medicine only. The criteria for improvement were a Hb decrease of 2 g% after treatment and a duration of improvement 1 mo. or longer. The duration of treatment was 24 days to 5.8 mo. Hb of 2 cases dropped to normal (in 1 case from 21.6 to 13 g%, in another from 22 to 14 g%). One case dropped 3.6 g%, 1 case 3.5 g%, 3 cases 3 g%, 1 case 2.5 g%, 1 case 2 g%, and 1 case showed no effect. The hematocrit of 5 patients dropped after treatment. In clinical practice the method is simple and effective. 233.
Chinese.

TRANSLOCATION

ANON Black rhino on the move.
Farmer's Weekly, 79043, 1989. 91.
CONSERVATION.

*ANON Puntlipneushoorns verhuisd.
Panda-Nieuws, 7 (4), 1971. 34-35.
TRANSLOCATION.

*ANON Rhino arrive.
Game Coin, June, 1984. 26-31.
TRANSLOCATION.

BORNER, M Translocation of 7 mammal species to Rubondo Island National Park in Tanzania. IN: NIELSEN, L & BROWN, R D (eds). Translocation of wild animals.
1988. i-xvii, 1-333. Chapter Pagination: 117-122, illus. Milwaukee Kingsville: Wisconsin Humane Society Inc. Caesar Kleberg Wildlife Research Institute.
TANZANIA; RUBONDO ISLAND NATIONAL PARK.
Colonisation success of translocated species.

*GRIMWOOD, I R Historical notes on the translocation of rhinos in Africa. IN: CUMMING, D H M and Jackson, P (Eds). The status and conservation of Africa's elephants and rhinos.
Proceedings of the Joint Meeting of IUCN/SSC African Elephant and African Rhino Specialist Groups, 1981. Hwange:
IMMOBILISATION/DRUGS.

*HARTHOORN, A M Translocation as a means of preserving wild animals.
Oryx, 6(4), 1962. 215-227.
CAPTURE; IMMOBILISATION/DRUGS.

*HITCHINS, P M Translocation of black rhinoceros Diceros bicornis from the Natal game reserves.
Lammergeyer, 33, 1984. 45-48.
TRANSLOCATION.

*MOLLER, J J Resettling South Africa's game.
Animals, 9 (5), 1966. 294-299.
SOUTH AFRICA.

NIELSEN, L BROWN, R D (EDITORS) Translocation of wild animals.
1988. 333 pp.; Many ref. Milwaukee, Wisconsin 53212, USA: Wisconsin Humane Society, Inc.
CAPTURE; RESTRAINT; TRANSPORTATION.
Most animal translocations are now conducted for conservation or ecological reasons. It is suggested that as suitable wildlife habitat is destroyed more conservation organizations will become involved in translocations in the future. This book which contains 21 papers by various authors serves as a source of information and reference to wildlife management agencies which are responsible for formulating translocation. It should be useful to conservation managers considering whether to translocate a population or not. The book is in two sections, general principles and guidelines and selected case studies. Topics covered in the first section include a survey of translocations of mammals in the USA, general considerations, planning, homing tendencies, and chemical immobilization of wildlife. Case studies in the second part, which often include descriptions of immobilization and capture, cover translocations of wolves, koala, African wildlife, rhinoceros, Alaskan wildlife, black- and white-tailed deer, moose, elk, pronghorn, and muskox. There is a subject index..

NOVELLIE, P A KNIGHT, M Repatriation and translocation of ungulates into South African national parks; an assessment of past attempts.
Koedoe, 37 (1), 1994. 115-119.
NATIONAL PARKS; SOUTH AFRICA.

*PLAYER, I C Translocation of white rhinoceros in South Africa.
Oryx, 9 (2), 1967. 137-150.
CAPTURE; SOUTH AFRICA.

RAATH, J P HALL MARTIN, A J Transport and boma management techniques for black rhinoceros Diceros bicornis as used in the Etosha Namibia-Vaalbos South Africa operation, IN: Rhinoceros Conservation Workshop, Skukuza, Kruger National Park, South Africa, August 31-September 4, 1988.
Koedoe, 32(2), 1989. 69-76.
NAMIBIA; TRANSPORTATION; BEHAVIOUR.

RHODESIA DEPARTMENT OF NATIONAL PARKS WILDLIFE MANAGEMENT Black rhinos moved 600 miles to sanctuary.
African Wildlife, 25(2), 1971. 54-57.
ZIMBABWE; POACHING.

*ROCHAT, K *STEELE,N Operation Rhodesian rhino: the translocation of square-lipped rhinoceroses from the Umfolozi game reserve in the Republic of South Africa to the Parks and Nature reserves of Rhodesia.
Lammergeyer, 8, 1968. 15-24.
TRANSLOCATION; UMFOLOZI GAME RESERVE; ZIMBABWE.

VINCENT, J Movement of square-lipped rhinoceroses Ceratotherium simum simum relocations.
Lammergeyer, (11), 1970. 80.
TRANSLOCATION.

VINCENT, J Movement of square-lipped rhinoceroses Ceratotherium simum simum relocations.
Lammergeyer, (10), 1969. 92.
TRANSLOCATION.

VINCENT, J Movement to zoos of square-lipped rhinoceroses Ceratotherium simum simum.
Lammergeyer, (13), 1971. 55.
ZOOS.

TRANSPORTATION

HENWOOD, R R The loading of black and white rhinoceros from a boma enclosure into a travelling crate.
Lammergeyer, 41, 1990. 45.
TRANQUILLIZATION.

ROGERS, P S Transportation and boma management of rhinos.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 136-154 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
MANAGEMENT.

ROGERS, P S Transportation of the black rhinoceros Diceros bicornis. IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 556-557. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
TRANSPORTATION.

ROGERS, P S Transportation of the rhinoceros by air or by sea. IN: MCKENZIE, A A (Ed). The Capture and care manual.
1993. 534-540. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
TRANSPORTATION.

ROGERS, P S Transportation of the white rhinoceros Ceratotherium simum. IN: MCKENZIE, A A (Ed). The Capture and care manual; capture, care, accommodation and transportation of wild African animals.
1993. 529-533. Pretoria: Wildlife Decision Support Services. South African Veterinary Foundation.
TRANSPORTATION.

VETERINARY MEDICINE AND SURGERY

ALTMANN, D Healing of a complicated open fracture in the nasal region of a wide mouthed rhinoceros given conservative therapy. (Zur Heilung einer Komplizierten offenen Fraktur im Nasenbereich eines Breitmaulnashornes bei konservativer Therapie), IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 29, 1987. 189-193; 17 ref.
TRANSPORTATION; ANTIBIOTICS; FRACTURES; SULFONAMIDES.
German.

BOEVER, W J Interdigital papilloma in a black rhinoceros.
Journal of the American Veterinary Medical Association, 165(9), 1974. 823.
PAPILLOMA; NEOPLASMS; FOOT DISEASES.

*CONDY, J B *MCCULLOCH, J I M *RODGER, J O K *THOMSON, J W The treatment of eight square-lipped rhinoceros (Ceratotherium simum) with an anthelmintic.
Journal of the South African Veterinary Medical Association, 34(1), 1963. 99-101.
ANTHELMINTICS.

DE VOS, V BRAACK, H H Castration of a black rhinoceros Diceros bicornis.
Koedoe, (23), 1980. 185-187.
CASTRATION.

ELLIOT, W M Possible predation of a black rhinoceros calf by a lion.
Lammergeyer, 38, 1987. 68, illus.
ECOLOGY; PREDATORS; LION.

#GOLTENBOTH, R Zehenfraktur bei einem Spitzmaulnashorn (Toe fracture in a black rhinoceros).
AZ, 8, 1988. 125-130.
FRACTURES.

#GOLTENBOTH, R Zu einigen chirurgischen Eingriffen bei Nashornern im Zoo Berlin (Surgical procedures on rhinoceroses in the Berlin Zoo).
Berliner und Munchener Tierarztliche Wochenschrift, 104, 1991. 15-18.
ZOOS; GERMANY; SURGERY.

#GOLTENBOTH, R Zur tierarztlichen Betreuung der Nashorner im Zoo Berlin (Veterinary treatment of rhinoceroses at the Berlin Zoo).
Zoologische Garten, 56, 1986. 43-52.
GERMANY; ZOOS.

HAIGH, J C Case of a constipated rhino.
Veterinary Record, 97(15), 1975. 282.
CONSTIPATION; DRUGS.

HEARD, D J OLSEN, J H STOVER, J Cardiopulmonary changes associated with chemical immobilization and recumbency in a white rhinoceros (Ceratotherium simum).
Journal of Zoo and Wildlife Medicine, 23(2), June 1992. 197-200, illus.
IMMOBILISATION/DRUGS; CARDIOLOGY; DRUGS; PHYSIOLOGY.

#JAYASINGHE, J B SILVA, V Electrocardiographic study on the African black rhinoceros.
British Veterinary Journal, 128, 1972. lxix-lxx.
CARDIOLOGY; ELECTROCARDIOGRAM.
The electrocardiographic patterns from the limb leads of an African rhinoceros are reported. A characteristic feature was the low voltages for all complexes.

JONES, D M The husbandry and veterinary care of captive rhinoceroses..
International Zoo Yearbook, 19, 1979. 239-252; 75 ref.
ZOOS; DISEASES; CAPTIVE CARE.
In 12 pages, the author deals with most aspects of the five species of rhinoceros. Characteristics and habits in the wild, husbandry and feeding in captivity, breeding, known biochemical and haematological facts, parasitology, clinical pathology and handling, and transportation: are all dealt with adequately, despite the brevity of the article. The author makes a plea for more information about this group..

#KLOPPEL, G Uber einen Fall von Volvolus jejuni bei einem Nashorn (Unsuccessful treatment of a jejunal volvulus in a rhinoceros).
Zoologische Garten, 21, 1956. 245-249.
VOLVULUS.

KOCK, N KOCK, M PAWANDIWA, A MATAMBO, T Postmortem findings in translocated black rhinoceros (Diceros bicornis) in Zimbabwe. IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 1989, Dortmund, 31, 1989. 275-279; 11 ref. Berlin, German Democratic Republic: Akademie Verlag.
TRANSLOCATION; TRANSPORTATION; ZIMBABWE; MORTALITY; STRESS.
English Summaries in German, French, Russian.

KOCK, N D KOCK, M D YOUNG, K B Hepatopathy in 2 black rhinoceroses (Diceros bicornis) in Zimbabwe ; Creosote toxicosis ?.
Journal of Zoo and Wildlife Medicine, 25 (2), 1994. 270-273.
HEPATOPATHY; ZIMBABWE; HAEMOLYSIS; TOXICOLOGY.
Four of twenty black rhinoceroses became lethargic, anorectic, anemic and jaundiced with elevations in serum bilirubin, after being moved into creosote-treated holding pens (bomas). One of these animals died, and a second became moribund and was euthanised. Both had oral and gastric ulcers, widespread hemorrhages and hematomata, and uniformly swollen, intensely green livers, containing excessive intrahepatic bilirubin. The remaining two animals made full clinical recoveries and additional cases were not seen in Zimbabwe, although three of these animals died with similar liver lesions after final translocation to the USA and two with similar liver lesions died after translocation to Australia..

KOCK, R A GARNIER, J Veterinary management of three species of rhinoceroses in zoological collections. IN: RYDER, O A (Ed). Rhinoceros biology and conservation.
Proceedings of an international conference, May 9-11, 1991, San Diego, California, USA, 1993. 325-345, illus. San Diego: Zoological Society of San Diego.
ZOOS; DISEASES; REPRODUCTION; CAPTIVE CARE.

#LEWANDOWSKI, A Cecal torsion in a black rhinoceros (Diceros bicornis) at the Detroit Zoo.
Personal communication, 1987.
ZOOS; UNITED STATES; CAECAL TORSION.

MILLER, R E Black rhinoceroses - a veterinary riddle.
ZooView, 26 (2), 1992. 4-5.
VETERINARY MEDICINE AND SURGERY.

#OLSEN, J Prolapse of rectum and bladder in a black rhinoceros (Diceros bicornis) calf.
Personal communication, 1992.
PROLAPSE.

*PEARSON, H GIBBS, C WRIGHT, A I Surgical treatment of a case of rectal prolapse in a young African rhinoceros (Diceros bicornis).
Veterinary Record, 80 (17), 1967. 519.
SURGERY; PROLAPSE.

#PROLE, J H B Removal of a prolapsed eyeball in a wild black rhinoceros.
Veterinary Record, 77, 1965. 156-157.
SURGERY; PROLAPSE.

REESE, K W EILTS, B E PIRIE, G Vaginal hemangioma in a white rhinoceros (Ceratotherium simum simum).
Journal of Zoo and Wildlife Medicine, 23 (4), 1992. 439-441.
HEMANGIOMA; REPRODUCTION.

SCHMIDT, R E TOFT, J D EASON, R L HARTFIEL, D A Possible toxic liver degeneration in black rhinoceroses (Diceros bicornis).
Journal of Zoo Animal Medicine, 13(1), 1982. 3-10; 8 ref.
LIVER; HAEMATOLOGY; TOXICOLOGY; POISONING; PATHOLOGY.

*SCHULZ, K C A Ulcerating wound behind the shoulder of the black rhinoceros (Diceros bicornis) in the Hluhluwe Game Reserve of Zululand.
African Wildlife, 15(1), 1961. 55-59.
HLUHLUWE GAME RESERVE; WOUNDS; ULCERS.

SOLL, M D WILLIAMS, M C Mortality of a white rhinoceros Ceratotherium simum suspected to be associated with the blue-green alga Microcystis aeruginosa.
Journal of the South African Veterinary Association, 56(1), 1985. 49-51.
HEPATOMEGALY; POISONING; MORTALITY; ALGA.

*SPINAGE, C A *FAIRRIE, R D Removal of a snare from a white rhinoceros in the West Nile White Rhino Sanctuary.
East African Wildlife Journal, 4, 1966. 149-151.
WEST NILE WHITE RHINO SANCTUARY.

STANLEY, T H New developments in opioid drug research for alleviation of animal pain, IN: AVMA (American Veterinary Medical Association) Colloquium on recognition and alleviation of animal pain and distress, Chicago, USA, May 15-17, 1987.
Journal of the American Veterinary Medical Association, 191(10), 1987. 1252-1253.
DRUGS; PAIN.

#STICKLE, J E MILLER, D C LEWANDOWSKI, A H Failure of passive immunoglobulin transfer in a black rhinoceros (Diceros bicornis) calf.
Journal of Zoo and Wildlife Medicine, 23 (2), 1992. 245-248.
IMMUNOGLOBULIN; IMMUNOLOGY; CALF.

VAHALA, J Brief analysis of veterinary care of black rhinoceros (Diceros bicornis) at Dvur Kralove Zoo. IN: IPPEN, R and SCHRODER, H D (Ed).
Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 23-27 Mai 1990, Eskilstuna, 32, 1990. 261-275; 45 ref.
CAPTIVE CARE; ZOOS; DISEASES.
English Summary in German, French, Russian.

VAHALA, J Vaginal prolapse in a female northern white rhinoceros Ceratotherium simum cottoni..
Proceedings of an International Symposium on Capture, Care and Management of Threatened Mammals, 1993. 21-24. Pretoria: South African Veterinary Association Wildlife Group.
PROLAPSE.

VAN HEERDEN, J KEFFEN, R H KUHN, F ROGERS, P MORKEL, P ATALIA, N RAATH, J P KERNES, D J Clinical pathology parameters in white, black and northern white rhinos.
Symposium on Rhinos as Game Ranch Animals, Faculty of Veterinary Science, Onderstepoort, 9-10 September 1994, 1994. 189-195 Pretoria: South African Veterinary Association Wildlife Group. University of Pretoria.
CLINICAL PATHOLOGY.

#YOUNG, E Lesions in the vicinity of the eye of the white rhinoceros (Diceros simus).
International Zoo Yearbook, 5, 1965. 194-195.
VETERINARY MEDICINE AND SURGERY.

*YOUNG,E Treatment of cutaneous granulomata in the black rhinoceros Diceros bicornis.
International Zoo Yearbook, 6, 1966. 276-277.
CUTANEOUS GRANULOMATA.

VIDEOS

CAYFORD, P LEBRUN, N The Rhino war; a desperate fight to save an endangered species.
1987. Washington: National Geographic Society.
VIDEOS.
Videocassette (60 minutes)..

WEAVER, C CRYAN, J Rhino rescue.
1980?. National Film Library.
VIDEOS.
Videocassette (24 minutes); narrated by David Attenborough.

VIRAL DISEASES

GEHRING, H MAYER, H Diagnosis and treatment of pox in the elephant. (Beitrag zur Diagnostik und Behandlung der Pockeninfektion bei Elefanten).
Praktische Tierarzt, 59(2), 1978. 106, 109; 11 ref.; 2 plates on pp.100-101.
POX VIRUS; IMMUNISATION.
Since its detection in 1963 at Leipzig Zoo, a number of cases of elephant pox have been reported both in zoos and circuses in both East and West Germany. In the early stages, the condition has few clinical characteristics, these being in the form of swallowing and mastication difficulties as a result of increased salivation and oedematous swellings on the head, trunk and belly. Primary conjunctivitis is always observed. Characteristic pox changes occur daily in the buccal-cavity mucosa, the tongue, trunk and perianal region and tail flap. The sores are lenticellular to hazelnut size and are greyish yellow and are surrounded by a wall-like edge and a central hilum. Skin necrosis may be observed in the early stages; the sole corium and other extremities also show putrefaction (silvery in colour and with a foul smell); the lower foot region rots and loosens; and pox changes in the vulva may be seen. The disease mainly affects Indian elephants and, to a lesser extent, the African elephant and rhinoceros. Outbreaks generally occur during the winter months. The mortality rate is high if the condition is not treated. The virus may produce isolated sores in man (e.g. the arms of elephant keepers) but these do not spread. Mayr's CVE-ENS vaccine inoculated s/c at the base of the ear lobe has been shown to be a successful prophylactic agent, being effective after a few days.. German.

#GOLTENBOTH, R Verdacht einer Herpesvirus Infektion bei Spitznashornern im zoologischen Garten Berlin (Suspected herpesvirus infection in a black rhinoceros in the Berlin Zoo).
Arbeitsbericht d. 8.Arbeitstagung der Zootierarzte im Deutsch-Sprachigen Raum, 1988. 123-124.
ZOOS; GERMANY; HERPES VIRUS.

#GRUNBERG, W BURTSCHER, H Uber eine pockenartige Krankheit beim Rhinozeros (Diceros bicornis L.) (Pox-like lesions and mucous membranes lesions).
Zentralblatt fur Veterinarmedizin B, 15, 1968. 647-649.
POX VIRUS.

MAYR, A MAHNEL, H Characterization of a fowl pox virus isolated from a rhinoceros.
Archiv fur die gesamte Virusforschung, 31(1-2), 1970. 51-60.
POX VIRUS.

#OLSEN, J Fatal encephalomyocarditis virus infection in a black rhinoceros (Diceros bicornis).
Personal communication, 1989.
ENCEPHALOMYOCARDITIS VIRUS.

PILASKI, J SCHALLER, K OLBERDING, P FINKE, H Characterization of a poxvirus isolated from white rhinoceros Ceratotherium simum simum. IN: 38th Meeting of the Deutsche Gesellschaft fur Hygiene und Mikrobiologie (German Society of Hygiene and Microbiology),Goettingen, West Germany, Oct 5-8, 1981.
Zentralblatt fur Bakteriologie Mikrobiologie und Hygiene 1 Abt Originale A 1 Abt Med Mikrobiol Infektionskr Parasitol, 251(4), 1982. 441.
POX VIRUS.

PILASKI, J ROSEN, A DARAI, G Comparative analysis of the genomes of orthopoxviruses isolated from elephant, rhinoceros, and okapi by restriction enzymes.
Archives of Virology, 88(1), 1986. 135-142; 29 ref.
POX VIRUS; VIROLOGY.
Orthopoxviruses from Elephas maximus (8 isolates), Ceratotherium simum (1), and Okapia johnstoni (2) were characterized by restriction enzyme analysis of the viral genome. The four enzymes BamHI, MluI, NcoI, and SalI were most useful for strain differentiation..

PILASKI, J SCHALLER, K MATERN, B KLOPPEL, G MAYER, H Poxvirus infection in elephants and rhinoceros (Pockenerkrankungen bei Elefanten und Nashornern).
IN: IPPEN, R and SCHRODER, H D (Eds). Erkrankungen der Zootiere.
Verhandlungsbericht des Internationalen Symposiums, 19-23 Mai 1982, Veszprem, 24, 1982. 257-265; 29 ref. 1086 Berlin, German Democratic Republic: Akademie Verlag.
POX VIRUS.
German Summaries in English, French, Russian.

SCHALLER, K PILASKI, J Pox in white rhinoceros (Ceratotherium s. simum) in Munster zoo. OT: Pocken bei Breitmaulnashornern (Ceratotherium s. simum) im Zoologischen Garten Munster.
Zoologische Garten, 49(3), 1979. 169-184; 16 ref.
POX VIRUS.
The outbreak involved a lightly affected adult female and a severely affected 3-month-old male. Both recovered. The disease did not spread to an adult male white rhinoceros nor to two African and two Indian elephants and four hippopotamus kept in the same animal house, nor to any of the zoo personnel (the elephants and personnel were vaccinated with attenuated vaccinia virus MVA). Orthopoxvirus from the lesions was visualized by electron microscopy and grown in embryonated hens' eggs. Laboratory rats used as food for carnivores were suspected as the source of the infection..
German.

SHEPHERD, A J SWANEPOEL, R SHEPHERD, S P MCGILLIVRAY, G M SEARLE, L A
Antibody to Crimean-Congo Hemorrhagic fever virus in wild mammals from Southern Africa.
American Journal of Tropical Medicine and Hygiene, 36(1), 1987. 133-142.
CRIMEAN-CONGO HAEMORRHAGIC FEVER VIRUS; ARBOVIRUS.
Crimean-Congo hemorrhagic fever (CCHF) virus is becoming increasingly recognized as an important human pathogen in southern Africa. In order to determine the role of wild mammals in the natural ecology of the virus, sera from 3,772 wild mammals of 87 species and from 1,978 domestic dogs collected in South Africa and Zimbabwe between 1964 and 1985 were tested for antibody to CCHF virus by reversed passive hemagglutination inhibition (RPHI) and by indirect immunofluorescence (IF). Antibody was found to be highly prevalent in large mammals in the Orders Artiodactyla and Perisodactyla such as giraffe, Giraffa camelopardalis (3/3 positive), rhinoceros Ceratotherium simium and Diceros bicornis (7/13), eland, Taurotragus oryx (59/127). Buffalo, Syncerus caffer (56/287), kudu, Tragelaphus strepsiceros (17/78), and zebra, Equus burchelli (16/93). In small mammals antibody was found in the sera of 40/293 hares, 22/1,305 rodents, and 1/74 wild carnivores, but not in 522 primates, 176 insectivores, or 19 hyrax. Antibody was also found in the sera of 118/1, 978 domestic dogs. The species of wild mammal in which antibody was distributed (with highest antibody prevalence in hares and large herbivores) reflects the feeding preference of immature and adult ticks of the genus Hyalomma, suggesting that Hyalomma sp. are the principal CCHF vectors in the wild. 170.

VITAMIN E

DIERENFELD, E S DU TOIT, R MILLER, R E Vitamin E in captive and wild black rhinoceros Diceros bicornis.
Journal of Wildlife Diseases, 24(3), 1988. 547-550.
ALPHA TOCOPHEROL; ANAEMIA; VITAMIN E.
The mean plasma level of .alpha.-tocopherol (vitamin E) measured in 31 free-ranging black rhinoceros (Diceros bicornis) was significantly higher ($P < 0.001$) than that in 11 captive animals (.hivin.x. +-. SE = 0.77.+-. 0.05 and 0. 18.+-. 0.03 .mu.g/ml, respectively). Vitamin E status may influence the health of captive black rhinoceros; in particular, it may be linked to hemolytic anemia commonly observed in these animals in captivity. 143.

DIERENFELD, E S Vitamin E levels measured in rhino browse plants.
Rhinoceros Conservation Newsletter, 1, 1990. 1-2.
PLANTS.

KIRKWOOD, J K MARKHAM, I HAWKEY, C M JACKSON, S I Plasma vitamin E response in two black rhinoceroses following dietary supplementation.
Veterinary Record, 128(8), 1991. 185-186; 6 ref.
VITAMIN E.
Two adult male captive black rhinoceroses (Diceros bicornis) were given d-alpha -tocopheryl polyethylene glycol 1000 succinate (TPGS) once daily with food at a dose rate of 12 000 iu per day for the first and 7500 iu per day for the second rhinoceros (approximately 8 and 5 iu/kg bodyweight daily, respectively). The doses were provided using bread soaked in a cooled liquid prepared by mixing melted TPGS in boiling water. Examination of blood samples collected regularly from the rhinoceroses showed that plasma vitamin E concentration increased from 0.6 mg/litre before TPGS supplementation to 3.9 mg/litre after 13 days in the first and from less than 0.1 mg/litre to 1.0 mg/litre after 14 days in the second rhinoceros. Samples collected from the first rhinoceros showed quite a rapid decline in plasma levels towards the baseline after supplementation ceased..

LEWIS, J C M KIRKWOOD, J K Studies on vitamin E supplementation in a black rhinoceros (Diceros bicornis).
Veterinary Record, 126(22), 1990. 558; 8 ref.
VITAMIN E.
Vitamin E supplementation trials were carried out over a 14-month period on a 17-year-old male black rhinoceros kept at Regent's Park Zoo, London on a diet of vegetables, concentrates and forage. Examination of blood samples collected at 4 week intervals showed there was no significant increase in the plasma concentration of 0.1 μ g alpha -tocopherol found on the arrival of the rhinoceros in December 1987 and after an 8 month period during which time the rhinoceros had received 12 500 IU vitamin E per day in alpha -tocopherol rich pellets. A change to a supplement of 12 000 iu alpha -tocopherol/day as the alcohol in a vegetable oil vehicle resulted in a decrease of plasma alpha -tocopherol from 0.2 μ g/ml to 0.14 μ g/ml over a 6 month period. The possible explanations for a failure to raise the plasma alpha -tocopherol levels are discussed..

PAPAS, A M CAMBRE, R C CITINO, S B SOKOL, R J Efficacy of absorption of various vitamin E forms by captive elephants and black rhinoceroses.
Journal of Zoo and Wildlife Medicine, 22(3), 1991. 309-317, illus.
VITAMIN E.

PAPAS, A M CAMBRE, R C CITINO, S C ACUFF, R V BAER, D J WOODEN, G R Species differences in the bioavailability of various forms of vitamin E, IN: 75th Annual Meeting of the Federation of American Societies for Experimental Biology, Atlanta, Georgia, USA, April 21-25, 1991.
FASEB (Federation of American Societies for Experimental Biology) Journal, 5(5), 1991. A918.
VITAMIN E.

PAPAS, A M CAMBRE, R C CITINO, S B Vitamin E: considerations in practical animal feeding and case studies with elephants and rhinoceros.
Proceedings of the Annual Dr Scholl Conference on the Nutrition of Captive Wild Animals, 8, 1991. 59-72, illus.
VITAMIN E; DIET.

ULLREY, D E Is vitamin E really the key to sexual satisfaction? IN: Meehan, T P, Thompson, S D and Allen, M E (Eds). Proceedings of the Eighth Dr. Scholl Conference on the Nutrition of Captive Wild Animals; Chicago, Illinois, USA, December 8-9, 1989..
1991. 49-58. VI+164p, illus, maps, paper. Chicago, Illinois, USA.: Lincoln Park Zoological Society.
NUTRITION.

ZOONOSIS

DALOVISIO, J R STETTER, M MIKOTA WELLS, S Rhinoceros rhinorrhea cause of an outbreak of infection due to airborne Mycobacterium bovis in zookeepers.
Clin Infect Dis, 15(4), 1992. 598-600.
MYCOBACTERIUM BOVIS; RHINORRHEA.
Seven of 24 zookeepers exposed to a Southern white rhinoceros infected with Mycobacterium bovis were presumably infected via aerosols generated in the cleaning of the barn for the rhinoceros. All demonstrated conversion by the intermediate-strength purified-protein-derivative skin test, but none had clinical illness. In certain occupational settings like zoos and abattoirs, exposure to M. bovis may be an occupational hazard, and routine periodic tuberculin screening should be performed. 20.

ZOOS

*BERTRAM, B Black rhinos in captivity.
Pachyderm, 4, 1984. 16.
ECOLOGY; BEHAVIOUR; ZOOS.

*BIGALKE, R *STEYN, T *DE VOS, D *DE WAARD, K Observations on a juvenile female square-lipped or white rhinoceros (Ceratotherium simum simum Burch)) in the National Zoological Gardens of South Africa.
Proceedings of the Zoological Society of London, 120, 1950. 519-528.
SOUTH AFRICA; BEHAVIOUR.

*BIGALKE, R Pretoria zoo has a baby white rhinoceros.
Animal Kingdom, 50(2), 1947. 48-55.
SOUTH AFRICA; CALF.

*BIGALKE, R White rhinos at Pretoria Zoo.
International Zoo Yearbook, 2, 1960. 43-44.
ZOOS; SOUTH AFRICA.

BLASZKIEWITZ, B Das neue Elefantenhaus im Tierpark Berlin Friedrichsfelde.
Zoologische Garten, 62(4), 1992. 212-221, illus.
ZOOS; GERMANY.
German.

#COENRAAD-UHLIG, V Von Gefangenleben eines jungen Nashorns (On the captivity of a young rhinoceros).
Zoologische Garten, 6, 1932. 114-116.
ZOOS.

*DITTRICH, L Birth and growth of a male white rhinoceros, Ceratotherium simum simum, at Hanover Zoo.
International Zoo Yearbook, 12, 1972. 122-125.
AGE; DENTITION; GROWTH; GERMANY; ZOOS.

*DITTRICH, L Breeding the black rhinoceros, Diceros bicornis, at Hannover Zoo.
International Zoo Yearbook, 7, 1967. 161-162.
GROWTH; BREEDING; GERMANY.

*DITTRICH, L Geburt eines Spitzmaulnasborns im Zoo Hannover.
Freunde des Kölner Zoo, 8(3), 1965. 90-92.
GERMANY; GROWTH; BREEDING.

*FREIHEIT, C F Denver zoo news.
International Zoo News, 18(2), 1971. 51.
GROWTH; UNITED STATES.

GILES, J R KELLY, J D Conservation and research programme proposals by the Zoological Parks Board of New South Wales.
International Zoo Yearbook, 31, 1992. 1-4.
AUSTRALIA; RESEARCH.

#GODFREY, R W DRESSER, B Coordination of research efforts involving rhinoceros in the United States.
Proceedings of the American Association of Zoo Veterinarians, 1989, 1989. 54.
RESEARCH; UNITED STATES.

#GOLTENBOTH, R Spitznashorn im Zoo Berlin (Black rhinos in the Berlin Zoo).
Vet.Bericht Nashorn EEP, 1991. Berlin:
GERMANY; ZOOS.

*HAYS, H R Notes on breeding black rhinoceroses, Diceros bicornis, at Pittsburgh Zoo.
International Zoo Yearbook, 7, 1967. 164-165.
GROWTH; UNITED STATES; BREEDING.

*HEDIGER, H Ein Nashorn mit Durer-Hornlein.
Zoologische Garten, 39(1/6), 1970. 101-106.
ZOOS.

*HILL, C A Third white rhino baby born.
International Zoo News, 20(1), 1973. 23.
BIRTH; ZOOS.

#KLOS, H-G FRADRICH, B Eine Uberblick uber die in zoologischen Garten gehaltenen afrikanischen Nashorner (An overview of African rhinoceroses in zoological gardens including causes of death).
Zoologische Garten, 38, 1970. 227-245.
ZOOS.

*MCCRANE, M Black rhino born.
International Zoo News, 14 (5), 1967. 135.
BIRTH; CALF; GROWTH.

NATAL PARKS BOARD Black rhino for San Diego, Gundwane.
NATAL WILDLIFE, 29(2), 1988. 4-5.
UNITED STATES; SAN DIEGO ZOO.

*REED, T H National Zoological Park; Annual Report of the Smithsonian Institution.
1969, 1969. 245-269.
GROWTH.

REID, G M Conservation status report.
North of England Zoological Society Annual Report 1991, 1992. 5, illus.
CAPTIVE CARE; UNITED KINGDOM.

*REYNOLDS, R J The black rhinoceros, Diceros bicornis, in captivity.
International Zoo Yearbook, 4, 1962. 98-113.
CAPTIVE CARE.

#REYNOLDS, R J White rhinos in captivity.
International Zoo Yearbook, 2, 1961. 32-42.
CAPTIVE CARE.

*REYNOLDS, R J White rhinos in captivity.
International Zoo Yearbook, 2, 1960. 42-43.
BREEDING; ZOOS.

*RONEY, E E White rhino birth at San Antonio.
International Zoo News, 19(6), 1972. 215.
ZOOS; UNITED STATES; SAN ANTONIO ZOO; BIRTH.

*ROOKMAAKER, L C Breeding of the rhinoceros in zoological gardens.
AAZPA (American Association of Zoological Parks and Aquariums) Newsletter, 14 (3), 1973. 5-8.
BREEDING; GROWTH.

ROOKMAAKER, L C Captive rhinoceroses in Europe from 1500 until 1810.
Bijdragen tot de Dierkunde, 43(1), 1973. 39-63.
EUROPE.

ROUHA, J Shaping the environment in Usti Nad Labem Czechoslovakia, IN: International Scientific Conference of Zoo Directors on Zoo and Environment, Berlin, East Germany, September 14, 1987.
Milu, 7(Spec. Issue), 1989. 63-64.
CZECHOSLOVAKIA.
German.

RUEMPLER, G Haltung und Zucht von Breitmaulnashornern (Ceratotherium simum simum) im Allwetterzoo Munster.
Zeitschrift des Koelner Zoo, 34(3), 1991. 91-102, illus.
CAPTIVE CARE; GERMANY.
German Summary in English.

#SMITH, L J A note on the birth of a white rhinoceros, Diceros simus, at Pretoria Zoo.
International Zoo Yearbook, 8, 1968. 134.
ZOOS; SOUTH AFRICA; BIRTH.

TOOVEY, J African plains exhibit at Whipsnade Park.
International Zoo Yearbook, 19, 1979. 270-274.
ZOOS; UNITED KINGDOM; WHIPSNADE PARK.

*ULMER, F On breeding rhinoceroses.
America's First Zoo, 10(3), 1958. 3-6.
ZOOS; BREEDING.

WEARS, J C Moats and ditches at London and Whipsnade Zoos England UK.
International Zoo Yearbook, 19, 1979.. 274-280.
UNITED KINGDOM.

*YAMAMOTO, S Notes on breeding of black rhinoceros at Kobe Zoo.
International Zoo Yearbook, 7, 1967. 163.
ZOOS; BREEDING; JAPAN.

APPENDIX A AUTHOR LIST

APPENDIX 3 DESCRIPTOR LIST

ACHELLES VENOM	ANATOMY, Peterson, J A Benson, J A Morin, J G McFail Ngai, M J, 060019309
ADOO ELEPHANT	BIOCHEMISTRY, Erasmus, T Hall Martin, GENETICS, *Hall-Martin, A J, 0000164. MANAGEMENT, Novellie, P Hall Martin, A J Joubert, D, 092122781.
AGE	ANATOMY, *Wilson, V J *Edwards, P W, 0000456. DESCRIPTION, Cave, A J E Rookmaaker, L C, 064067572; Hitchins, P M, 052129751. GENETICS, *Du Toit, R, 0000112. HORN, Clarke, G P Y, 095098023; Pienaar, D J Hall Martin, A J Hitchins, P M, 094001414. MORPHOLOGY, *Groves, C P, 0000154; *Ritchie, A T A, 0000334. REPRODUCTION, Blaszkiewitz, B, 0000011; *Maruska, E J Dresser, B L Barden, H D, 0000287. TEETH, *Anderson, J L, 0000013. ZOOS, *Dittrich, L, 0000102.
AGGRESSION	BEHAVIOUR, Popp, J W Bankfeldt-Popp, L, 082040681.
ALPHA CRYSTALLIN	BIOCHEMISTRY, De Jong, W W Smears, A Cohen, L H, 066056166.
ALPHA TOCOPHEROL	VITAMIN E, Dierenfeld, E S Du Toit, R Miller, R E, 086088041.
AMBOSELI	STATUS, *Guggisberg, C A W, 0000159.
AMPUTATION	HORN, Franz, W Seidel, B Jacob, A, 9127033.
ANAEMIA	BIOCHEMISTRY, Ghebremeskel, K Williams, G Lewis, J C M Du Toit, R, 087033920. DISEASES, Chaplin, H JR Malecek, A C Miller, R E Bell, C E Gray, L S Hunter, V L, 082050674; Miller, R E, 0000480; 0000536; Miller, R E Boever, W J, 7169194; Paglia, D, 0002302.
ANAESTHETICS	IMMOBILISATION/DRUGS, #Kock, R A Jago, M Galland, F M D Lewis, J, 0000586.
ANATOMY	BEHAVIOUR, *Kingdon, J, 0000245. HORN, Dathe, H, 127000014050; *Ryder, M L, 0000405. MORPHOLOGY, Maluf, N S R, 091113970. TAXONOMY, Groves, C P, 061018432.
ANTHELMINTICS	VETERINARY MEDICINE AND SURGERY, *Condy, J B *McCulloch, J I M *Rodger, J O M *Thomson, J B, 0000634.
ANTHRAX	BACTERIAL DISEASES, Mbise, A N Nyange, J F C Mbasha, E N S, 7746491.
AORTIC ARCH	ANATOMY, Cave, A J E, 065024618.
ARTHRITIS	DISEASES, #Wallach, J D, 0000749.
ASPERGILLUS	DISEASES, Gamsinhardt, H Ippen, R, 9313954.
AUGRABIES NATIONAL	CONSERVATION, Powers, S, 99194356.