Table 12. Some results from observations of northern white rhinos ln Garamba National Park, April 1984—October 1986.

A. AGE AND SEX RATIOS

Age ratio of confirmed known animals		
MA	4	22%
FA	5	28 %
S	5	28 %
J	4	22%

B. OBSERVED HOME RANGES

Individual	Size (sq. km)	Dates of observation
M2	185	Mar 84 - Oct 86
M3	112	May 84 - Oct 86
M4	259	Aug 84 - Oct 86
M5	105	Apr 85 - Oct 86
M6	218	Mar 86 - Oct 86
M7	174	Feb 86 - Sep 86
M8	86	Apr 86 - Sep 86
M9	132	Mar 86 - Oct 86
F1 and 1a	138	Apr 84 - Oct 86
F3, 3a and 3b	137	Apr 84 - Oct 86
F4, 4a and 4b	196	Jan 85 - Oct 86
F4 and 4a	82	Jan 85 - Apr 86
F4 and 4b	65	Aug 85 - Oct 86
F5 and 5a	93	Apr 84 - Oct 86
F6 and 6a	57	Mar 86 - Oct 86
3a/4a	90	Jul 85 - Oct 86

Mean range for adult males	183 sq. km(well known only)
Mean range for adult females	124 sq. km
Mean range for S2	143 sq. km
Range for S1	90 sq. km
Total range of direct Observations	676 sq. km

C. FREQUENCY OF OBSERVED SOCIAL GROUPS

Group composition	No. Observations	% of total
MA	103	32
FA	6	2
MA+FA	14	4
AU	9	3
MA+FA+S	11	3
MA + FA/s + J/s	27	8
MA + FA + S +J	3	0.9
MA + S/s	3	0.9
FA + S	8	2
FA + J	115	35
FAs + Js	1	0.3
FA + S + J	9	3
FAs + Ss + Js	1	0.3
S	5	2
S	18	6

M = male; F = female; U = unknown; A = adult; S = sub-adult; J = juvenile.

GARAMBA NATIONAL PARK — MANAGEMENT

Information presented by Charles Mackie (Garamba Rehabilitation Project)

The rehabilitation of Garamba is an IUCN project in collaboration with the Zairois Institute for Conservation of Nature, funded by the World Wide Fund for Nature (WWF), the Frankfurt Zoological Society and UNESCO. The objectives of the project are:

— to re-equip the Park;
— to restore the infrastructure;
— to retrain staff to control poaching.

Efforts are directed at the conservation of the entire Garamba ecosystem (not specifically at rhino conservation).

By the end of its initial three-year period, the project will have cost US$600 000. Two expatriates are employed full-time to assist in the Park management.

Guards are constantly on patrol in the main rhino area, with other guards nearby at a radio base, in constant contact with the Park headquarters. There are 24 patrol posts around the periphery of the Park with 4-6 guards living under uncomfortable conditions in each.

A major constraint to the management of the Park is the dense grass growth, which severely restricts horizontal visibility for at least half the year, and makes patrolling difficult. Hence an aircraft is particularly valuable for surveillance work.

At present, it would not be sensible to attempt to translocate the Garamba rhinos elsewhere; this is against government policy, and the animals appear to be relatively secure, and breeding well. A long-term international commitment to Garamba is necessary if current levels of support are to be maintained until the rhino population has at least doubled; this will require an investment of about US$1 million, in addition to the US$0.6 million already spent. To support a field biologist to closely monitor the rhinos and study various biological and ecological aspects, the initial annual cost would be about US$42 000 with continuation costs of US$26 000. Generation of revenue through tourism could not be significant until the Park's tourist facilities are considerably Improved; if tourism does develop, a procedure exists whereby the funds could be returned directly to the Park.

NORTHERN WHITE RHINOS IN CAPTIVITY

Information presented by David Jones (Zoological Society of London), Ulysses Seal (IUCN Captive Breeding Specialist Group), and Oliver Ryder (Zoological Society of San Die go).

When Dr. Faust of Frankfurt Zoo carried out a survey of northern white rhinos in captivity he determined that there was an old animal at San Diego, another at London, and one at Antwerp which has since died. There were also animals of doubtful origin at Riyadh and a male at Khartoum. The largest captive group was (and still is) at Dvur Kralove in Czechoslovakia. At the invitation of the zoo managers at Dvur Kralove, D. Jones and U. Seal visited this zoo in February 1986. The Czechoslovakian authorities indicated a strong interest in developing a constructive breeding programme and have maintained close liaison with the Captive Breeding Specialist Group (CBSG). Some work has been done to facilitate the management system so that more females can become productive. As part of this plan, the male from London was sent to Dvur Kralove in the summer of 1986.

There are currently ten animals at Dvur Kralove including one of mixed sub-specific ancestry. The oldest t and dominant cow — which originally came from Britain (Knowsley) ——has had offspring sired by three different males, the first of which was a southern white. The hybrid from this latter mating was born in 1977, while the pure-bred northern white rhino calves were born in 1980 and 1983. This same female was in oestrus in the summer of 1986 and was sequestered with a northern white bull; she can be expected to reproduce in 1987. Owing to the technical difficulties of shifting animals, the other females are without bulls during oestrus periods, and none have reproduced. The chief constraint at Dvur Kralove is the extremely cold winter climate. The animals cannot safely be allowed out of their housing for about seven months of the year, hence much of the mixing has to be done in a very restricted space. The animals are separately boxed and there is a natural reluctance on the part of the managers to mix animals which have not been in direct contact for a week or two. There have also been problems in the rhinos' diet, about which recommendations have been made by the CBSG deputation.

Moving the animals to a warmer climate would be the most desirable option but may not be realistic In view of political constraints. Adopting a two-year time limit for Improved breeding at Dvur Kralove, prior to suggesting a major translocation, 1a probably the best approach. The potential breeding animals are approximately 15 years old so they should theoretically have up to 15 years additional reproductive life. in the meanwhile, the Dvur Kralove staff must be given maximum encouragement and assistance with their efforts to build up this rhino group.

REFERENCES

CURRY-LINDAHL, K. (1972). War and the white rhinos. Oryx, 11: 263-267

HILLMAN-SMITH, K., BORNER, M., MANKOTO MA OYISENZOO, ROGERS, P., and SMITH, F. (1983). Aerial census of the Garamba National Park, Zaire, with Emphasis on the Northern White Rhinos and Elephants. Report to IUCN/WWF/GEMS/FZS.

HILLMAN-SMITH, K., OWEN-SMITH, N., ANDERSON, J.L., HALL-MARTIN, A.J., and SELALADI, J.P. (1986). Age estimation of the white rhinoceros *(Cerathotheriurn simum).* Journal of Zoology, 210: 355-379.

OWEN-SMITH, R.N. (1973). The Behavioural Ecology of the White Rhinoceros. PhD thesis, University of Wisconsin.

SAVIDGE, J.H., WOODFORD, H.H. and CROZE, H. (1976). Report on a mission to Zaire. FAOW/K1593 KEN/71/526 —ZA1 /70/001.

VAN GYSEGHEM, R. (1979). Zur Okologie des nordiichen Breltmulnashorns
Ceratotherium simum cottoni,
Lydekker 1908. Thesis, Universitat Kaiserslantern.

REPRODUCTIVE RESEARCH UPDATE

Session Chairman BETSY DRESSER

INTRODUCTION

To start off this session, I would like to present the ideal scenario — the ideal for rhinos using the reproductive technology that has been hinted at during these meetings. That is, to collect semen for artificial insemination or embryos for embryo transfer, or better yet to be able to freeze semen and embryos and to move these cells around the country or around the world. We would like to bank these cells for years, thus helping to maintain an effective population size. That is the ideal. But the reality is that semen has been collected from black and white rhinos, it has been frozen and thawed successfully but it has never been used successfully to produce any offspring; artificial insemination procedures have been attempted in these species but have not yet succeeded. Embryos have not been collected from any species of rhinos nor, of course, have they been frozen. So we have a way to go.

Research is in its infancy and much of it needs to be applied, particularly the artificial reproduction techniques. in most cases — supplementing behavioural studies ——the greatest effort has focused on endocrine evaluations of oestrus cycles, and essentially we are still at the stage of trying to reliably determine the oestrus cycle of the rhinos in our care.

HORMONAL EVALUATIONS OF RHINO OESTRUS CYCLES AND PREGNANCY

A presentation was made by Dr. Ed Ramsay, formerly of the Oklahoma City Zoo, and Lonnie Kasman, formerly of the San Diego Zoo who, in a joint effort with Dr. Bill Lasley (also formerly of the San Diego Zoo) worked on a cooperative project with 19 zoos in North America.

With the forming of the AAZPA Species Survival Plans, around 1982, these researchers attempted to develop some strategies and techniques that the managers of rhinos in captivity might be able to utilize to help improve the captive breeding of their animals. The strategy that was adopted was to look at urinary steroid hormones; what was hoped was to better understand the reproductive physiology of the rhino (particularly the black and Indian rhinos) both through the oestrus cycle and pregnancy. Since blood is difficult to get from the animal when not immobilized, the strategy that has some obvious advantages is urine collection. In addition to being safer to collect, urine is readily available ln vast quantities!

All of this work was done at the San Diego Zoo, and since the San Diego Zoo Endocrine Lab had a history of using radioimmunoassays for urinary steriod conjugate analysis, that is the method that was used. Preliminary studies there indicated that estrone sulphate, or estrone conjugates, would be useful for monitoring follicular activity in the Indian rhino and there was hope that it would also be useful in the black rhino.

Pregnanediol glucuronide (PdG) is an assay that was developed at the San Diego Zoo for monitoring luteal activity, or what was assumed to be luteal activity as a progesterone source in the rhino. That is the information that is presented in Figure 8.

The parturition which is indicated is the 1985 calf born at the Cincinnati Zoo. All the hormone values are indexed to creatinine to account for variability in the water content of the urine sample, so PdG is ng/mg creatinine.

Essentially what is seen are baseline levels (below the ensitivity of the assay) for about the first trimester of