

– Plenary presentation: Research –

## Research and the White rhino (*Ceratotherium simum*) EEP

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### The start

The white rhino (*Ceratotherium simum*) EEP was established at the Ninth Annual EEP Conference in Edinburgh in July 1992.

The main problems of the new breeding programme were:

- poor breeding
- captive population not sustainable

In the past 50 years, 626 white rhinos were imported from the wild to captive facilities world wide. 479 calves were born, of which 131 births took place in Europe. Only approximately 20% of the wild-born specimens reproduced and the breeding rate for the F1 generation has been as low as 8%.

The first application of research-based knowledge were ethological observations carried out in the field, mainly publications of Norman Owen-Smith from the early 1970s on territoriality and social organization in the white rhinoceros. Further research and examination of animals within the breeding programme were urgently needed.

### Overview of research-based annual recommendations

#### Recommendations 1993:

- Keep white rhinos in groups, not in pairs
- Enlarge facilities or stop keeping white rhinos and change species

#### Recommendation 1994:

- Start with research. Cooperation with Prof. Dr. Franz Schwarzenberger, Institute of Biochemistry of the Veterinary University in Vienna. The zoos of Dvur Kralove and Usti nad Labem provided samples for the development and use of a non-invasive method of examination of hormone metabolites in female faeces, enabling the determination of cycle length and quality as well as pregnancy

#### Recommendations 1995:

- Avoid „brother and sister behaviour” - cases where males and females, being put together at a very early age, regard each other as close relatives and do not reproduce together (natural prevention of inbreeding)
- Keep two males in each facility in order to allow natural stimulation
- The first Husbandry Guidelines were published

#### Recommendations 1996:

- Widely use monitoring of faecal hormonal metabolites
- Do not give up working with older animals

The graphs in figures 1-3 show the normal oestrous cycle as well as the pathologies.

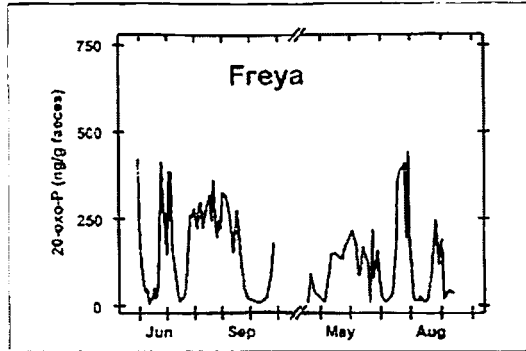


Figure 1) The oestrus cycle length is 35 or 70 days.

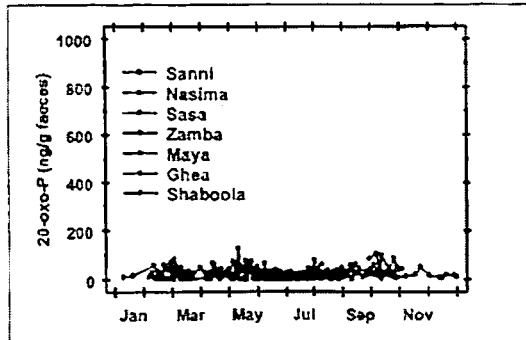


Figure 2) Acyclicity: problem animals 'Flatliners' (30% of population)

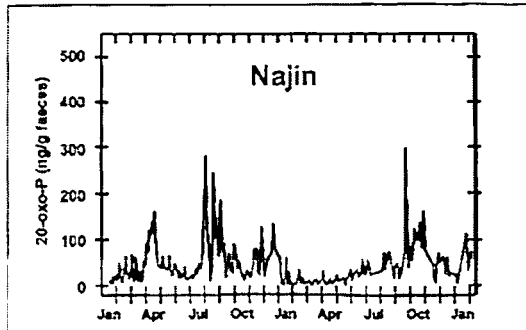


Figure 3) Problem animals: Persistent Luteal Activity (30 % of population)

**Recommendations 1997:**

- Intensify behavioural studies in member zoos;
- Allow calves to stay in a social group, do not transfer them before 2.5-3 years of age (see also figure 4);

- Cooperation with Prof. Dr. Udo Ganslosser, University of Erlangen, based on encouraging and coordinating student research activities in white rhino EEP member institutions. Supervised behavioural, nutritional, genetic and veterinary research studies (total number 24): 14 in Germany, three in France, three in the Czech Republic, and one each in the Slovak Republic, Austria, Israel, United Kingdom - of which two on free ranging animals in reserves and 22 on captive animals in EAZA zoos. Seven of them were dissertation and 11 diploma theses.



Figure 4) Experiencing social behaviour is very important for the calves

**Recommendation 1999:**

- Intensify faecal hormone monitoring, initiate new social situations. The recommendation became known as "M & M" - Monitor and move!! The goal was to follow a female's hormonal reactions to changes of her social environment by means of endocrine monitoring. The efforts resulted in an increase of white rhino births in member zoos: up to 13 births in 2000.

**2000-2002**

The white rhino EEP project obtained an international grant: An IRF/ SOS Rhino Sponsored Integrated Approach to Enhance the Reproductive Performance of white rhinoceroses in the EEP. The project was a result of cooperation among the international team of three European institutions:

- Institute for Zoo- and Wild Animal Research (IZW) Berlin, Research Group Reproduction Management: Robert Hermes, Thomas Hildebrandt, Frank Göritz - who carried out clinical examinations of males and females
- Institute of Biochemistry of the Veterinary University in Vienna: Franz Schwarzenberger - who conducted endocrine monitoring
- Salzburg Zoo Hellbrunn: Christian Walzer and Sandra Silinski - in charge of anaesthesia and animal training.



**Reproductive assessment in rhino females**

- Ongoing endocrine monitoring over the past 12 years, involving the examination of females in zoos on four continents: n = 54 female white rhinos
- Discovered problems: ovarian and uterine pathology, severe cystic degeneration.
- Treatment options: GnRH agonist implant (Deslorelin) for ovarian down-regulation, ovulation induction and artificial insemination in females. Two AI attempts resulted in pregnancy.

**Reproductive assessment in rhino males**

19 males examined with 36 semen collections followed by cryo-preservation of the genetic material.

Valuable contribution to the Husbandry Guideline Manual: the new anaesthesia and sedation protocol by Ch. Walzer.



Figure 5) The IZW team during rhino female examination in Dvur Kralove, April 2004

The reproductive results have been improved step by step, the following items are presented in table 1 as well as in figure 6.

When comparing the totals of the first and the second five years of the white rhino EEP, a doubling of the breeding results is evident:

- 1995-1999: 16 births - seven primiparous females
- 2000-2004: 32 births - 13 primiparous females

Table 1) Reproduction 1993 - 2004

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
No. of particip.	58	55	54	59	62	62	65	68	66	65	65	64
Status M:F	94:97	78:99	73:96	75:103	76:105	77:105	78:105	93:126	87:115	85:112	84:123	85:124
No. of births	2	5	0	2	3	7	4	13	6	3	4	6
No. of prim. F	0	0	0	1	2	1	3	6	3	3	1	0
No. of breed. zoos	7	7	7	8	9	10	12	14	16	17	17	17

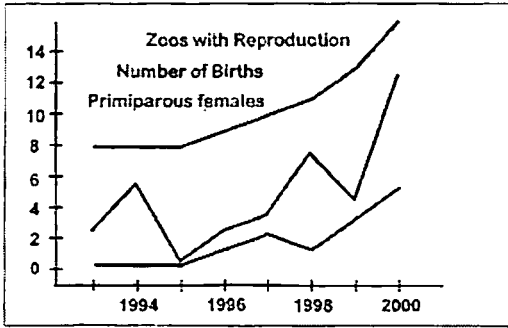


Figure 6) White rhino statistics since 1993

Research and the application of the results into practice is a team effort and it is necessary to highlight the efforts of all colleagues who assisted in the projects: the research teams, the teams of curators and veterinarians in individual zoos, the directors of rhino-keeping zoos who decided to invest in rhino research, the sponsors.

We intend to continue our research activities in order to obtain more detailed knowledge of rhino reproduction, to be able to assist the most endangered rhino species and subspecies: the northern white rhino (*Ceratotherium simum cottoni*) and the Sumatran rhino (*Dicerorhinus sumatrensis*).

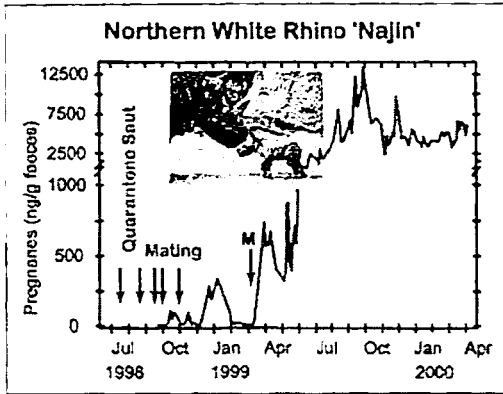


Figure 5) Northern white rhino 'Najin'

#### Literature

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