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Edited by
Amy B. Plowman
Paignton Zoo Environmental Park
Totnes Road
Paignton
Devon TQ4 7EU

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Zoological Gardens
Regent's Park
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Tel: 0207-586 0230
Fax: 0207-722 4427
E-mail: fedzoo@zsl.org

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Environmental enrichment: not just monkey business. Techniques for two southern white rhinoceros, *Ceratotherium simum simum* at Paignton Zoo Environmental Park

Paul Hudman
School of Biosciences, University of Wales Cardiff, PO Box 915, Cardiff CF10 3TL

Abstract
Environmental enrichment is now generally recognised as an important part of the husbandry of captive animals. However, much of the enrichment effort is concentrated on primates, with the exception of elephants, hoofstock often seem to be benignly neglected. As with many grazing herbivores, free-living white rhino spend much of their day feeding or in the search for food whereas in captivity nourishment is plentiful and generally easily accessible. This can lead to behavioural problems; particular concerns with the pair at Paignton Zoo being inactivity and lack of breeding. An enrichment programme was instigated which aimed to: decrease the time spent inactive, increase amount of foraging behaviour, decrease aggression between the pair and possibly through these effects encourage oestrus activity in the anoestrus female. Initial results are encouraging: small quantities of browse mixed with the normal diet and a tyre feeder significantly reduced inactivity and aggression of both individuals and increased time spent foraging. Areas for further study include olfactory enrichment and devices to improve the animals' dermatological condition.

Introduction
In recent years the importance of environmental enrichment for captive animals has been an important area of husbandry research. However, possibly due to their greater dexterity, much of this work has concentrated on primates. Hoofstock in general and ungulates in particular seem somewhat short-changed by this 'revolution' in animal husbandry.

Concerns with Paignton's rhinos are not due to the occurrence of abnormal behaviours but rather to the absence of some natural behaviours. Like many megaherbivores, free-living rhino will spend much of their day feeding or in the search for food. This can cause a problem in captivity where nourishment is plentiful and generally in a very accessible form.

Aims
- To decrease the amount of time both animals spend in inactivity
- To increase the amount of foraging behaviour shown by both animals
- To decrease any aggression directed at each other
- Through the enrichment of the environment stimulate oestrus activity in an anoestrus female (a long shot!)

Methods
Animals
The male rhino, Mickey, was wild caught and is thought to be 31 years old, he arrived at Paignton in 1992 from Blackpool Zoo. The female, Gracie, was born at Whipsnade in 1979 and moved to Paignton in 1981.

Enrichment
Two forms of enrichment were tested initially: fresh browse mixed with the normal ration of hay and a 'tyre tower' consisting of several car tyres bolted together was chained to a tree stump in their

enclosure. As white rhino are not naturally browse-eating and may suffer adverse effects of tannins or other secondary compounds if too much browse is eaten, care was taken to ensure this supplement could constitute no more than 20% of their daily intake on those days it was used and a mixture of several species was used. The tyre tower was designed to be pushed around and could also have food hidden in it. To date the two enrichments have not yet been provided at the same time.

Data collection and analysis
Observations were taken of both individuals using instantaneous scan sampling. Recordings were made every 30 seconds for half hourly periods throughout the daylight hours. Simultaneous continuous recordings of infrequent behaviours, especially those related to courtship, were also taken. Similar amounts and times of data have been collected for non-enrichment and enrichment days. For this poster three behaviour types have been compared before and during enrichment using Mann-Whitney tests: inactivity, foraging and aggression. Preliminary results are shown

Results

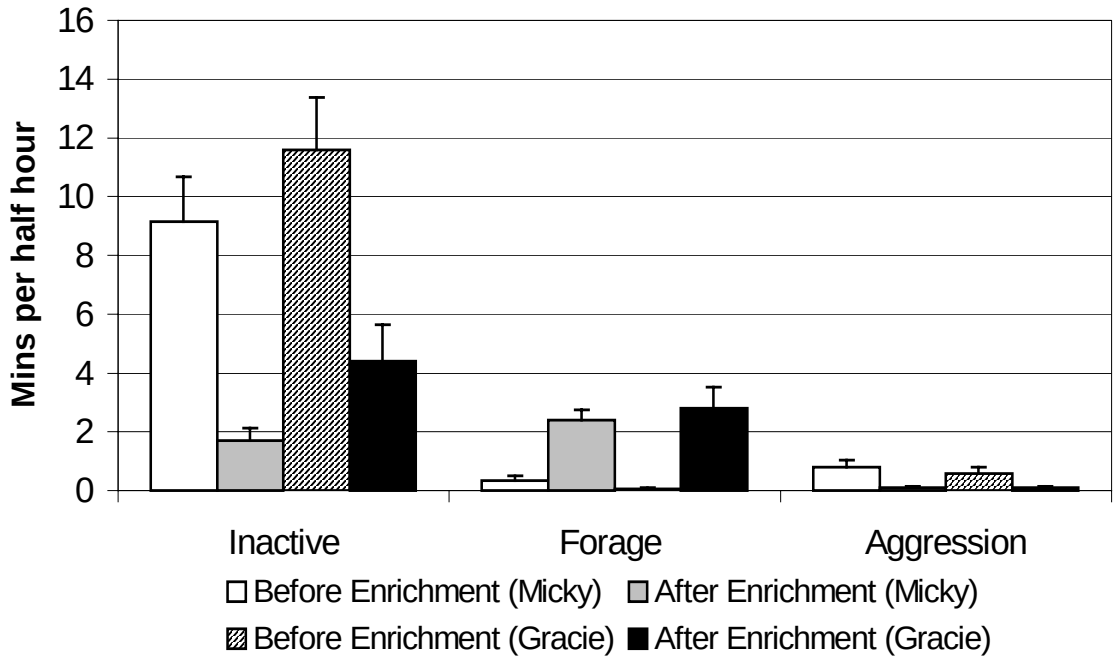

Figure 3. Mean time spent performing three behaviour types by two white rhino before and during enrichment.

Discussion and conclusions
The preliminary enrichment results look promising: the time spent inactive by both individuals has dropped significantly ($p < 0.05$ for both) and time spent foraging has increased significantly ($p < 0.05$ for both). Aggression has also decreased but since these levels are very low more data are needed to confirm whether this change is significant. So far there has been no effect on Gracie's anoestrus state. Areas for further study include olfactory enrichment and devices to improve our animals' dermatological condition.

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