
Keywords: Acinonyx jubatus/activity/behaviour/captivity/cheetah/environmental enrichment/jaguar/Panthera onca/Panthera tigris/pattern/puma/Puma concolor/tiger/zoo

Abstract: Environmental or behavioural enrichment have in recent years become household terms within the zoo community. This paper summarises the strategies developed and implemented for felids in the Salzburg Zoo. In all felid species it was possible to increase the daily activity budget and induce novel previously not observed behavioural patterns. Within the described strategies two are to be considered particularly successful: scatter feeding in all species and the provision of live fish as prey to the jaguars.
From the Salzburg Zoo Hellbrunn (Director: Dr. R. REVERS)

FROM RILKE TO ENRICHMENT:
STRATEGIES FOR FELIDS AT THE SALZBURG ZOO

By Ch. Walzer

The bars which pass and strike across his gaze have stunned his sight: the eyes have lost their hold.
To him it seems there are a thousand bars, a thousand bars and nothing else. No world.
R.M. Rilke: The Panther (Jardin des Plantes, Paris)

Introduction

Having come a long way since Rilke's day it is at the present generally accepted within the zoo community that the sole provision of adequate nutrition and protection from the elements is no longer sufficient and acceptable in establishing housing criteria. "Environmental/Behavioural Enrichment" has become a household term in most zoos. Though the term is fairly recent the idea goes back to the very beginnings of modern zoo biology. Back in 1942 in his standard publication H. HEDIGER pointed out that complex structural enrichment of the enclosures is of utmost importance for animal welfare.

Enrichment strategies should help to promote and facilitate complex behavioural patterns within the restrictive and biologically saturated zoo environment. A prerequisite is that the enclosure structure must provide the animal with the most basic control possibilities; sun, shade, hides, observation points etc. Most free-ranging animals must invest a large proportion of their daily time budget in the acquisition of food (HERBERS, 1981). Increasing the foraging and exploration behaviour by implementing a specific feeding enrichment protocol is one of the most successful strategies that have been published (MARKOWITZ, 1982; CARLSTEAD et al., 1991; SHEPHERDSON et al., 1993; REINHARDT, 1993). Apart from these feeding enrichment strategies one should not disregard other potential enrichment possibilities such as social stimulation in mixed species exhibits, exhibit furniture and specific devices (toys).

While many enrichment protocols and strategies have been published very few deal specifically with large cats. The Salzburg Zoo Hellbrunn has from the onset taken on a progressive role in providing its large cats on the one hand with large naturalistic enclosures and on the other since many years with an individual enrichment program.

All enrichment strategies at the Salzburg Zoo are planned in conjunction with the animal keepers. The initiation procedure follows a set of loosely defined guidelines that always try to take the cost and work-time factor into consideration (see fig. 1). To a large extent the daily observations are carried out by students.

![Diagram](attachment:image.png)

**Fig. 1**

Selected results and strategies

The aim of this paper is to provide an overview of the methods employed and the experiences gained at the Salzburg Zoo. It would be far beyond the scope of this paper to give detailed accounts of statistically significant behavioural changes in single species.
In an initial very basic study three phases were defined and summarised as follows: active phase (moving), reactive phase (not moving eyes open), resting phase (eyes closed). The behavioural changes between days with enrichment and days without were quite dramatic (see fig. 2).

Apart from these very general quantitative changes an increase in behavioural play could be induced and observed by the placement of toys in the enclosure. Of 400 observed units while objects were in place within the enclosure 42 – 109 units were spent manipulating the toys. Vertical poles and wood pieces with and without scent marking were not observed to bring about a significant behavioural change. Due to the scatter feeding previously unobserved hunting behaviours were also noted.

**Tiger (Panthera tigris) 1,2:**

Enrichment strategies used within the tiger enclosure

1. Vertical poles with and without scent markers.
2. Swinging branches.
3. Ice blocks containing fish in pond.
4. Scatter feeding with small pieces of meat.

Similar to the experiences observed in the pumas the enrichment strategies induced quantitative and qualitative changes in the behaviour. As in the pumas the scatter feeding increased the active exploratory behaviour. In contrast to the pumas the vertical poles induced an increase in the spray marking from the male animal, however he rarely marked the actual vertical poles. Significant changes in enclosure utilisation were noted at the initiation of the enrichment strategies for all three animals. (see fig. 3)

**Jaguar (Panthera onca) 1,1:**

1. Scatter feeding with small pieces of meat.
2. Live fish.
3. Heavy piece of wood (25 kg) with numerous holes filed with meat bits.

**Puma (Felis concolor) 1,2:**

Various enrichment strategies and devices were used within the puma enclosure: Total daily time commitment for the keeper: 10 – 15 min.

1. Scatter feeding with small pieces of meat. These were placed on branches, suspended on strings, hidden within branches and on the ground.
2. Vertical poles, vertical poles with Frezwalski horse scent, pieces of wood from the tiger enclosure.
3. Toys, football, rubber boot with and without meat, swinging branch.
4. Suspended branches (can support weight of Jaguar) with meat.
5. Suspended cow tails (can support weight of Jaguar).
6. Various scent marks (blood, horse dung).
7. Ice block with meat/fish/chicken.

As in the other cats the Jaguars exhibited a change in their daily activity budget. In the pre-enrichment phase (1556 observed units) the two animals exhibited active behaviour in 21% of the time. During the enriched phase (1296 observed units) the animals active behaviour increased to 32%. Fig. 4 demonstrates some of the qualitative changes in behaviour between the pre-enriched phase and the enriched phase.

As in the other species some of the enrichment strategies were extremely successful whereas others hardly elicited a response from the animals. Most successful was the provision of live fish. The live fish on the one hand motivated the animals to perform predatory behaviours, and on the other elicited a prey seeking/observation behaviour that was previously absent. The Jaguars spent a considerable amount of time manipulating the very heavy piece of wood attempting to drag it through the enclosure or into their respective sleeping dens. It should be noted that the Jaguar was the only species that exhibited a marked increase in antagonistic behaviour resulting in cut and bite wounds. As in the other cats scent marking was by and large considered to be unsuccessful.

Cheetah (Acinonyx jubatus):
1. Scatter feeding.
2. Mechanical prey lift.
3. Scent marks.

By far the most successful enrichment method used with the cheetahs is the mechanical prey lift. Though this enrichment strategy has no statistically relevant quantitative influence on the daily activity budget, it is responsible for a specific individual predatory behaviour. This behaviour is not observed on days when the lift is not in use. The lift is installed in a triangular fashion with three side lengths of 85 meters. On two lenghts it is possible to let the cheetahs “hunt”. A small piece of meat is attached to the moving cable and then dragged through the enclosure. The maximum speed that is reached is 65 km/h. The lift is used at irregular intervals (four - five times a week), however taking into consideration the amount of visitors present in the zoo (therefore most often it is in use on the weekends). Single sprints last on the average approximately seven seconds. Considering the numerous lift passages the animals spend two - three minutes daily “hunting” at high speeds. The cheetahs have developed specific individual predatory behaviours. Whereas one female has specialized in jumping for the meat the other has to run each piece down. The rate of success varies accordingly, the jumping strategy was 100% successful in the observed time frame, the sprinting technique was only 50% successful in the same time frame.

Discussion

In all species the initiation of an enrichment program increased the daily activity budgets. These strategies also induced novel previously not observed behavioural patterns increasing the captive species specific behavioural repertoire.

Two protocols are to be considered the most successful, scatter feeding in all species and the provision of live prey to the jaguars. Similar to the results in a fishing cat (Felis viverrina) and in leopard cats (Felis bengalensis) published by SHEPHERDSON et al. (1993) this enrichment resulted in “functional naturalistic foraging behaviour” to directly obtain food and similar protracted behaviour as the cats never knew when the last piece of meat had been found.

Considering the low financial and time investment needed to initiate an enrichment program as described in this paper, enrichment should be considered a necessary and integral part in the proper care and management of captive felids. It should not be disregarded that this program will not only benefit the cats but also the zoo visitors that will be able to appreciate a more active, behaviourally diverse and on the whole more interesting cat.

Summary

From Rilke to Enrichment: Strategies for felids at the Salzburg Zoo

Environmental or behavioural enrichment have in recent years become household terms within the zoo community. This paper summarises the strategies developed and implemented for felids in the Salzburg Zoo. In all felid species it was possible to increase the daily activity budget and induce novel previously not observed behavioural patterns. Within the described strategies two are to be considered particularly successful: scatter feeding in all species and the provision of live fish as prey to the jaguars.

Zusammenfassung

Von Rilke zur Lebensraumbereicherung: Strategien für Katzen im Salzburger Tiergarten Hellbrunn

Der Begriff der Lebensraumbereicherung ist in den letzten Jahren zu einem Schlagwort in der Zoogemeinschaft geworden. Diese Arbeit beschreibt die Bereicherungsstrategien, die im Salzburger Tiergarten Hellbrunn für Feliden entwickelt und eingesetzt wurden. In allen Fäl-
len war es möglich, die tägliche Aktivität zu steigern, und neue vorher noch nie beobachtete Verhaltensmuster auszulösen. Zwei Methoden erwiesen sich als besonders erfolgreich: Streufütterung bei allen Arten und die Fütterung von lebenden Fischen an die Jaguare.

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