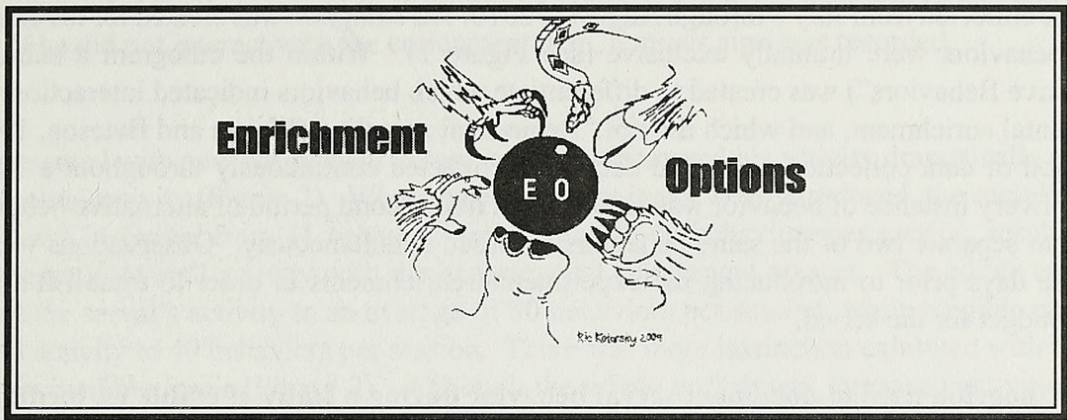




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Evaluating Interaction with Edible and Inedible Enrichment Items by an African Serval (*Leptailurus serval*)

By

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Introduction

Environmental enrichment has been shown to reduce stereotypic behavior and increase activity and natural behaviors in captive felids (Skibieli et. al., 2007; Wooster, 1997). Small captive felids, such as African servals (*Leptailurus serval*), have been known to interact with hanging or moving objects, as well as different types of food items. Bones, hanging pieces of meat, and flying meatballs have all been shown to elicit natural behaviors such as leaping and reaching. Enrichment has also been shown to increase enclosure usage (Shepherdson et. al., 1993) and assist in identifying health problems (Mellen et. al., 1979). The veterinary staff at the Washington Park Zoo in Portland diagnosed a congenital diaphragmatic hernia in a male serval by recording his behavior with enrichment and monitoring his levels of activity. Data that deviated from the norm indicated potential medical concerns.

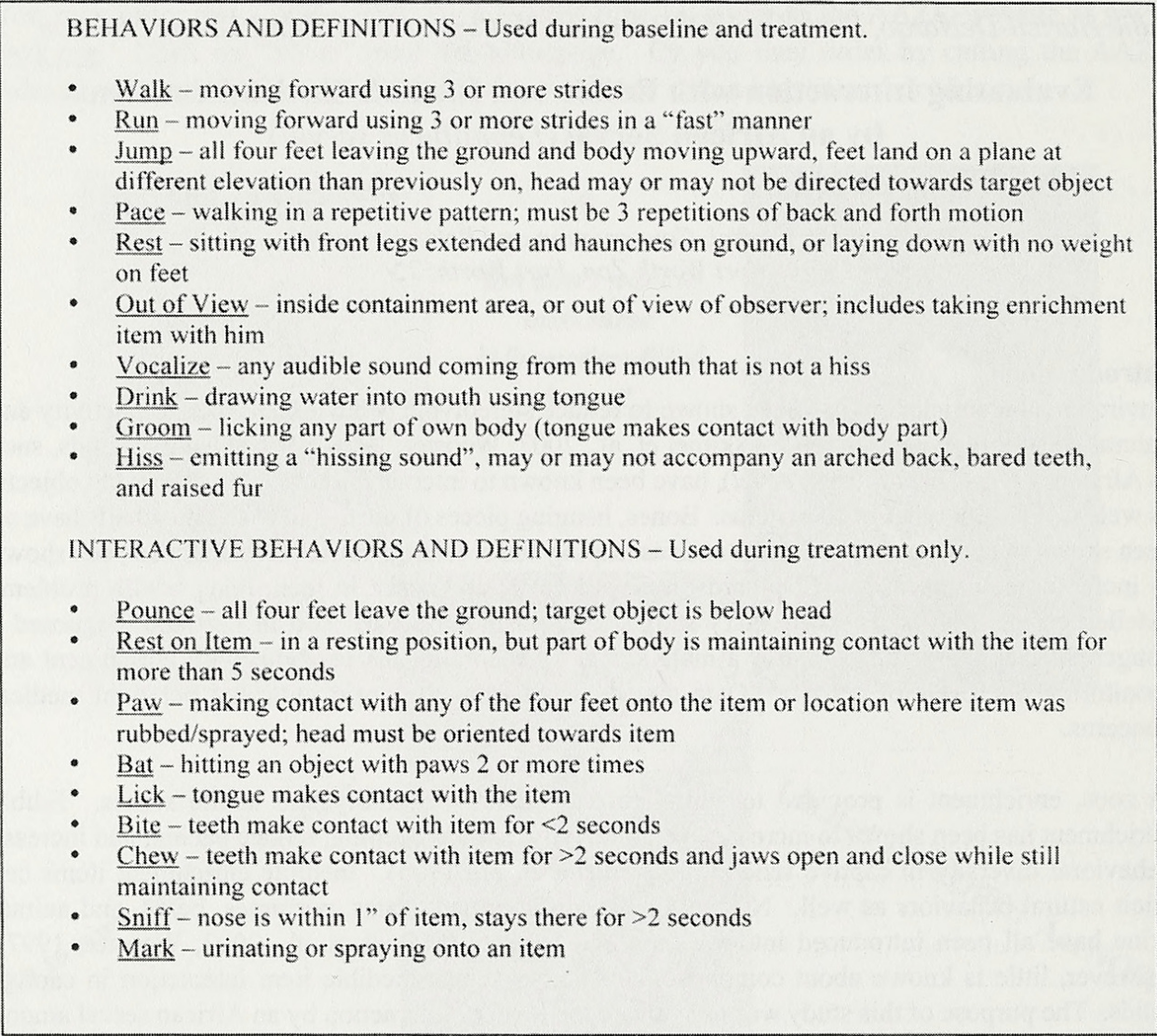
In zoos, enrichment is provided to stimulate the olfactory, auditory and tactile senses. Edible enrichment has been shown to increase overall activity, reduce sleeping, reduce pacing, and increase behavioral diversity in captive felids (Shepherdson et. al., 1993). Inedible enrichment items can elicit natural behaviors as well. Nature sounds, different substrates, perfumes, herbs, and animal urine have all been introduced into various felid habitats (Skibieli et. al., 2007; Wooster, 1997). However, little is known about comparisons of edible versus inedible item interaction in captive felids. The purpose of this study was to evaluate the level of interaction by an African serval among eight different enrichment items: four edible and four inedible. The serval's overall activity within the enclosure was also monitored and recorded.

Materials and Methods

The subject for this experiment was a six-year-old male African serval housed at the Fort Worth Zoo's Animal Outreach and Conservation Center (ARCC) in Fort Worth, TX. He was housed solitary off exhibit from the public, and had daily training and interaction with his keepers. He had a history of ingesting enrichment items and because of this, any enrichment item introduced into his enclosure had to be closely evaluated for safety. This reduced the number of approved enrichment items he was allowed to have unsupervised. Once he was fully mature however, his keepers wanted to re-introduce items that might elicit more activity within his enclosure.

Data were collected from July 8 through August 4, 2010. An ethogram was created for the experiment and all behaviors were mutually exclusive (see Figure 1). Within the ethogram a sub-category (“Interactive Behaviors”) was created to differentiate which behaviors indicated interaction with the experimental enrichment, and which did not. Behavioral sampling (Martin and Bateson, 1993) was the method of data collection used, and data were collected continuously throughout a 30-minute session. Every instance of behavior was recorded. A five-second period of alternative behavior was required to separate two of the same behaviors recorded simultaneously. Observations were made over three days prior to introducing the experimental enrichments in order to establish a baseline activity budget for the serval.

Fig. 1. Ethogram used to document serval behavior during a study of edible vs. inedible enrichment at the Fort Worth Zoo.



Eight enrichment items were chosen for the experiment. The items used were minnows in a 3x4 ft. (0.9x1.2 m.) tub of water, a frozen block of blood, crickets, stripped beef shank bone, a 3x3 ft. (0.9x0.9 m.) suspended hammock, sand in a 3x4 ft. (0.9x1.2 m.) tub, a suspended grapevine ball, and bubbles from a battery operated bubble machine. Each item was presented alone during three sessions of 30 minutes each, for a total of 90 minutes per item. The schedule for the presentation of items was chosen at random and introduced daily at approximately 1000hrs and 1500hrs. No item was presented twice in the same day, and each item was presented at least once in the morning and afternoon.

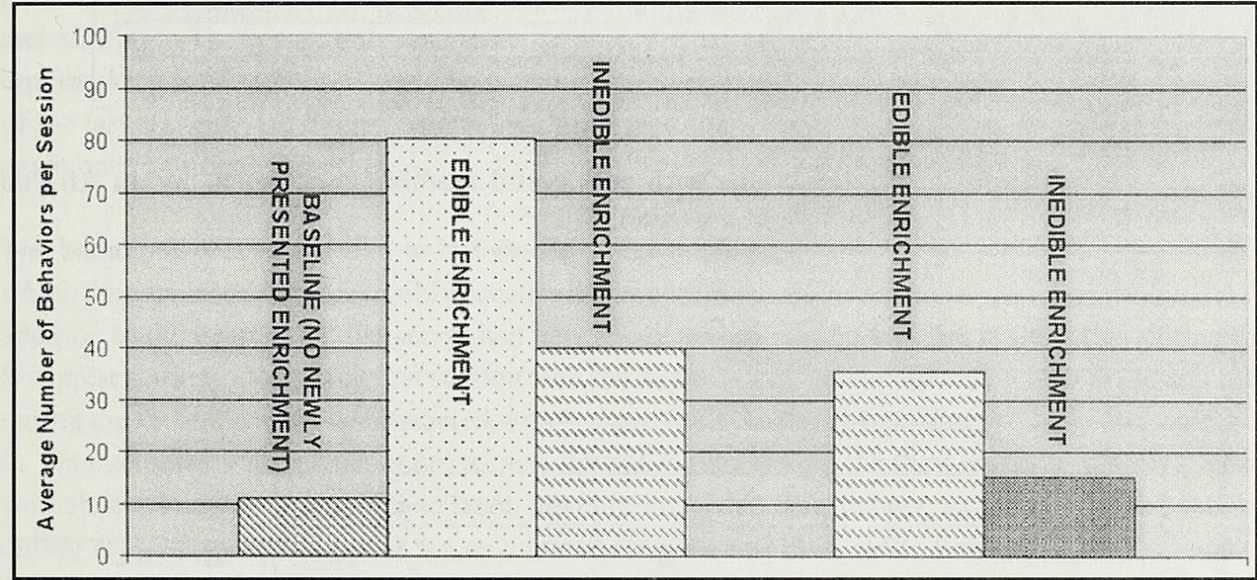
Additionally, the observation period was broken down into three-minute intervals, and data were recorded using the One-Zero method (Martin and Bateson, 1993). This gave a total of 10 intervals for each 30-minute period. If the serval interacted with the item for more than five seconds, a plus

mark was recorded for that interval to show that he interacted with the item during that three-minute period. If he did not interact with the enrichment item, a minus sign was recorded.

Results

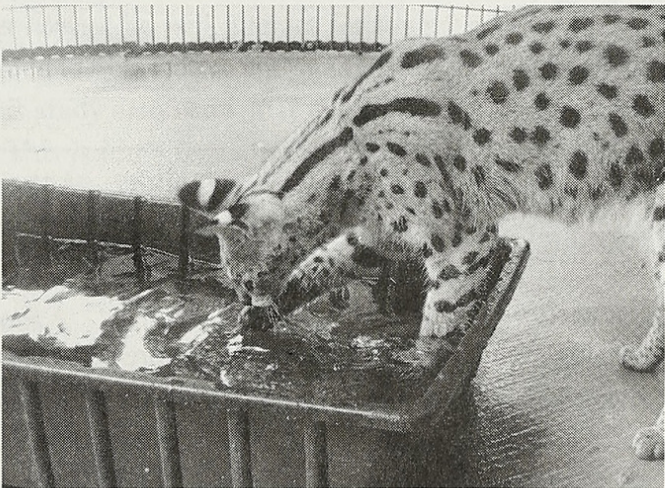
When presented with new enrichment items, the serval increased his activity dramatically compared to his baseline activity (Figure 2). When the enrichment items were introduced, the serval’s average activity level increased from 11 behaviors per session to 60 behaviors per session, resulting in an 81% increase in overall activity with the experimental enrichment present. The edible enrichment increased the serval’s activity to an average of 80 behaviors per session, while inedible enrichment increased activity to 40 behaviors per session. There was more interaction exhibited with the edible items than inedible items (Figure 2). Although the edible enrichment increased activity by twice as much, both categories of items were effective in increasing overall activity within the enclosure. Every enrichment item introduced, regardless of whether it was edible or inedible, was interacted with at least once when it was presented. The average number of interactions per session with the edible enrichment was 35, while the average number of interactions with inedible items was 13. This resulted in a difference of 62% more interactions with edible items than inedible items.

Fig. 2. Average number of behaviors exhibited by a serval during baseline and treatment sessions at the Fort Worth Zoo.



The enrichment that elicited the most interactive behaviors (average of 86 interactions per half hour session) was the minnows in water (Figure 3). The item that elicited the least amount of interactive behaviors (average of three interactions per half hour session) was the hanging grapevine ball.

Data also suggest that the minnows in water elicited the longest durational interaction throughout the half hour session (Figure 4). The serval interacted with the minnow enrichment at least once during every interval throughout the sessions. He interacted with the sand tub during 56% of the intervals, resulting in the sand tub as the second longest item with which he interacted. Grapevine balls elicited the least amount of durational interaction, with interaction occurring during 16% of the intervals.



The serval pawing at the minnows in water tub at Fort Worth Zoo. (Photo: R. Ryan)

Fig. 3. Average number of interactions with edible and inedible enrichment items by an African serval at the Fort Worth Zoo.

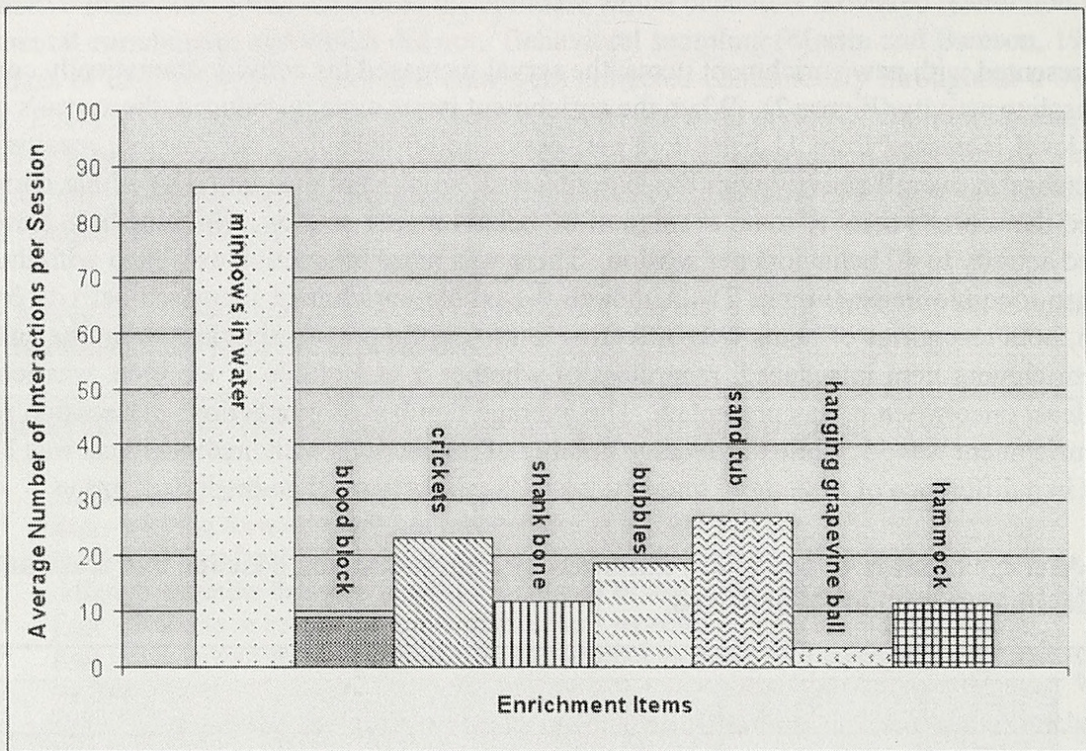
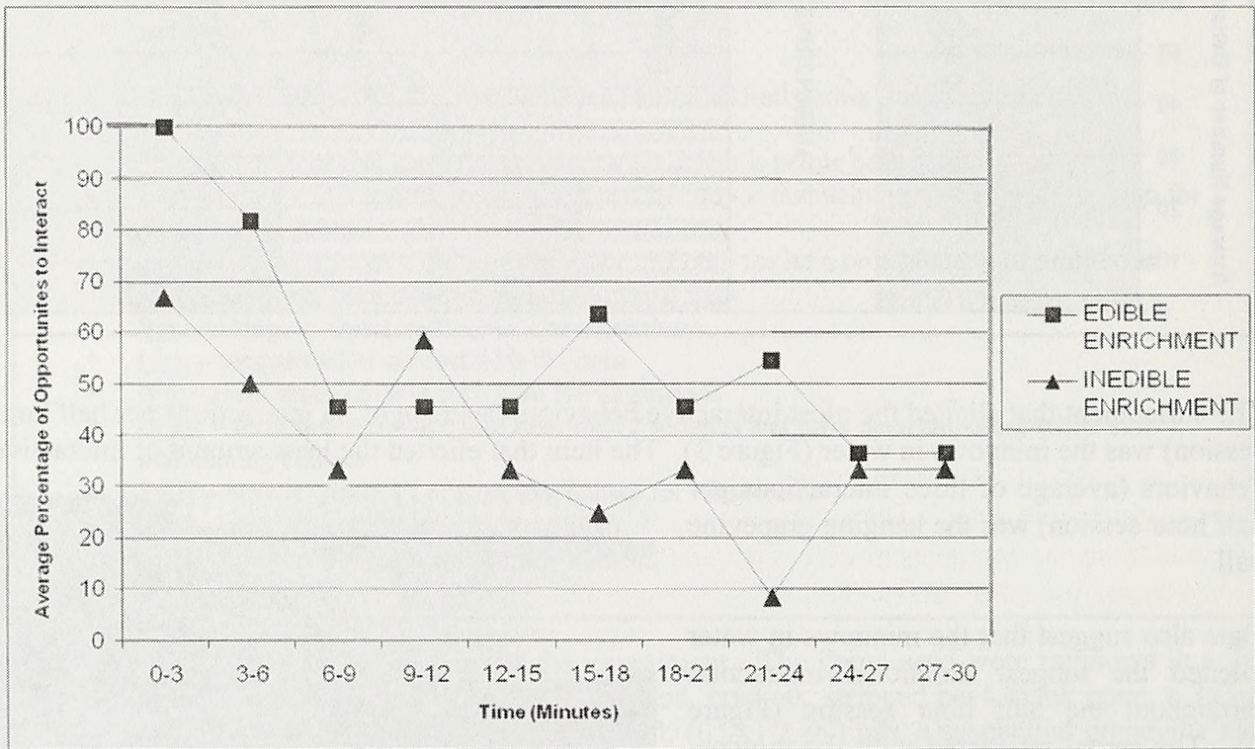


Fig. 4. Average number of interactions with edible and inedible enrichment by an African serval during each interval throughout a session.



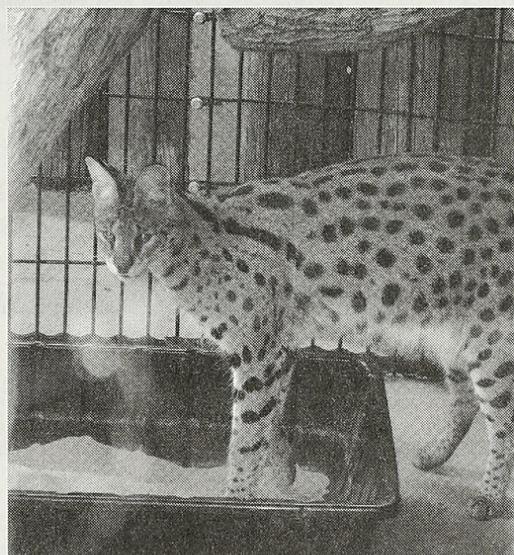
Discussion

Enrichment items that moved elicited more activity and interaction by the serval than stationary items. Given that minnows in water not only move but are also edible, previous studies have suggested that this enrichment would elicit more interaction than those that are non-moving or non-inedible (Wooster, 1997). These data support this hypothesis. The fish also elicited more hunting behavior (sniffing, pawing, biting and eating) by the serval than the other items (Figure 3). However, under

this hypothesis, the serval should have interacted with the crickets and the bubbles more than the other items that did not move, but he did not. For the most part, he watched the bubbles and pawed at the crickets, but did not pounce or jump on them as predicted. This could be because these items were not naturally appropriate for serval ingestion.

Among the edible items, the shank bone was the second to last most interacted with. However, only two sessions were included because one bone was quite different from the other two bones. It was not completely stripped of meat as were the previous two bones that had been presented. To assure consistency with the other two sessions, this particular session was removed from the study, and the data adjusted accordingly.

Of the inedible enrichment items, the sand tub elicited the most interactive behaviors by the serval (Figure 3). This could be because this substrate was new to him. The enclosure that the serval inhabits has a concrete floor with large logs for climbing and resting. The tactile quality of the sand may have been softer on the serval's paws, so he may have been more inclined to interact with it by pawing and sniffing. There was only one instance recorded of him marking in the sand tub, and this was during the end of the last session. He did not interact with the sand tub again once he urinated in it



The hammock was the second to last inedible item with which the serval interacted, possibly because it was a large addition to the habitat that the serval had never seen before, and he avoided it altogether during the first presentation. During the first session with the hammock he did not interact with it at all, and then during the second session he interacted with it almost half the time by sniffing, pawing, and resting in it. He interacted with the hammock almost the entire time during the third and final session. Many animals need time to desensitize to large, novel items within their habitat, so his avoidance behavior during the first presentation was not uncommon (Mellen and Ellis, 1996; Ramirez, 1999).

The serval interacting with the sand tub at Fort Worth Zoo. (Photo: B.Kunkel)

Conclusions

Although all of the enrichment items elicited some interactive behavior, the results of this study suggest that the African serval at the Fort Worth Zoo will interact more with edible enrichment items than inedible items. The study also suggests that he will interact for longer periods of time with edible items. Minnows in water elicited the most interactive and maintained behaviors for the longest periods of time. However, data from this study also show that the serval increased activity when presented with the inedible enrichments. This is important to note because some cats in zoos can be at risk for obesity and keepers may need alternatives to food for enrichment. Perhaps future studies can investigate enrichment preference by providing two items at the same time or by varying the way in which items are presented (e.g., scattered, hanging, buried, tossed, etc.) to determine number and duration of interactions by cats in zoos.

Acknowledgements

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