A Formative Evaluation of *Habitat Africa!'s Thirsty Animal Trail* Prototype Series

Carolyn Heinrich
Kathryn Appelbaum
Barbara Birney
Brookfield Zoo
Brookfield, Illinois

Introduction

A central theme of the *Habitat Africa!* waterhole exhibit is that waterholes are areas of concentrated but limited resources, and the distribution of water shapes the physical and behavioral adaptations of the animals which survive around it. Since predators as well as prey animals must share this scarce resource, fascinating interactions often occur among and between species as they approach the waterhole to drink. The *Thirsty Animal Trail* is intended to encourage visitors to imagine themselves as thirsty animals trying to gain access to a waterhole safely.

The primary message of this trail is that animals use their well-developed senses to communicate with each other and survive. This message includes the concept that animals attend to cues from species other than their own. A series of interactive exhibit components composed primarily of text and artifacts is intended to challenge visitors as they proceed along the trail. Visitors are asked to play the role of an animal and use their senses of sight, hearing, and smell to escape danger. The message that smell plays a larger role in communication among certain animals than it does among humans is also emphasized.

There were four exhibit components of particular interest for this evaluation project. The first component, *Keeping Track of Dinner*, drew visitors' attention to leopard tracks which led to a "carcass" in a tree about fifteen feet to the right and rear of the visitor. Text labels explained that a leopard will often stash the carcass of its prey in a tree and that this visual indicator suggests the predator may still be close by.

The second component, *Dangerous Droppings*, was a simulation of antelope dung with text explaining that the dung pile of a male antelope is a visual and olfactory cue to an antelope that it might be entering another animal's territory. For the third component, *Alarm Call Interactive*, the sound of a zebra bark was re-created with a hidden tape-recorder. Visitors

were asked to play the role of an animal on the trail and decide to respond to the sound either by fleeing or ignoring it.

Current plans for the final trail indicate that there will be six different animal sounds presented to visitors. It is hoped that this feature will communicate the overall concept that certain sounds which appear threatening to humans might be ignored by other animals, while ostensibly non-threatening sounds might actually be cause to take flight. Another important message of the animal call component is that animals attend to sounds of species other than their own.

Finally, the fourth component, *Eau de Alarm*, gave visitors the opportunity to smell musk and explained that when frightened, some animals release musky odors which can confuse predators. During this project interpretive planners were interested both in whether visitors used the individual prototypes as intended, and whether they acquired the appropriate message. In particular, the objectives of evaluation could be reduced to five questions:

(1) Would visitors acquire the overall trail message?
(2) Would they notice the animal artifacts/biofacts placed on the trail to communicate that areas such as waterholes are fraught with danger?
(3) Did they acquire the main messages of each individual component that had been selected for testing?
(4) Did visitors use the components appropriately?
(5) How did visitors feel about their experience on the trail?

Interpretive planners were also interested in visitors' reactions (e.g., disapproval, fascination, etc.) to different artifacts or biofacts.

Methods

The Research Sample

A questionnaire was administered to a total of 159 visitors. Of these, 109 had used the trail, and the other 50 participants constituted a control group. In addition, over a period of three days, 125 groups were observed using the individual trail components.

Materials Used

The *Thirsty Animal Trail* was set up in a wooded area adjacent to the children's zoo. It consisted of the following components (in order of presentation): an entrance sign; graphics accompanying an antelope skull; *Keeping Track of Dinner* graphics and leopard footprints leading to a "carcass" in a tree; *Dangerous Droppings* graphics along with antelope dung and tracks; a zebra *Alarm Call* interactive; the *Eau de Alarm* component; and the *Thirsty Animal* drinking fountain.

Two versions of the questionnaire were given to visitors. The questionnaire used for visitors surveyed on the trail was composed of four open-ended questions and several closed-ended items (see Appendix A). The Control group received a questionnaire which omitted two open-ended questions from the original since these were specific to visitors who had used the trail (see Appendix B). Since the final version of the trail would also include interpretive components on animal communication, the Control group was also tested for their knowledge of how certain species communicate threat.

Appropriate use of each prototype by visitors was identified in operational terms, and observers then recorded whether visitors used the individual components in the desired manner.

Procedure

Baseline date collection

Questionnaires were administered to a control sample of 50 visitors who had not seen or used the trail. They were randomly selected to participate as they walked the main path of the zoo's southeast quadrant.

Trail testing

A docent, standing on the main pathway of the zoo's southeast quadrant, encouraged visitors to try out the trail. A sign placed on the pathway solicited visitors' help, and directed them toward the trail. Visitors followed a set of smaller signs to the trail entrance. Their use of the trail was unguided. When visitors reached the end of the trail, they were asked to participate in a survey.

A camouflaged observer was stationed in the woods to take notes as visitors used the leopard footprints/carcass area and antelope dung and tracks area. A second observer operated the tape recorder which provided sound for the alarm call interactive, and simultaneously watched visitors using this interactive and the *Eau de Alarm* component.

Twenty-seven visitors were surveyed on Day 1, and 27 were interviewed on Day 2 of testing. On the first day, an observer recorded her impressions of the visitors' use of the *Keeping Track of Dinner* prototype (see Figure 1). Her notes indicated that most visitors read the entire sign and looked at the treetops around them until someone in the group spotted the carcass. The tree holding the carcass was distinctive—old and burly with no leaves. Few visitors appeared to notice the leopard tracks on the ground, and rarely did they notice the tracks before they spotted the carcass.

On Day 2, a track was placed directly on the cement base of the *Keeping Track of Dinner* sign, in an effort to direct more attention to the remaining tracks on the ground (see Figure 2). The track illustrations were moved from the graphic to the base with the hope that visitors would realize

they were to seek out the track molds on the ground. A sign was also added to the base of the tree that held the carcass.

Visitors still read the graphic near the trail and looked around, but they appeared to locate the sign on the tree rather quickly. The placement of the leopard track on the stand appeared to attract attention to the tracks leading toward the tree as well. Still, the most common sequence followed by visitors was to locate the main sign, the tree graphic, the carcass, and then the tracks. Despite the modifications, an examination of responses for each test item showed no group differences. The 54 surveys from both days were combined as Treatment Group A.

On Day 3, modifications were made to the *Eau de Alarm* prototype and *Keeping Track of Dinner* in response to preliminary findings. A brief explanation of why musk odor may confuse predators was added to *Eau de Alarm.*

The entire text for *Keeping Track of Dinner* was moved to the carcass tree and a prompt question was located at the base of the sign stand on the trail, close to the tracks (see Figure 3). Survey data were gathered on 55 visitors, who comprised Treatment Group B.

Data Analysis

Frequencies and percents were computed for closed-ended items on the trail questionnaire. Categories were developed for responses to open-ended items, and frequencies and percents were then calculated for these questions as well. Observational data were analyzed by calculating the frequencies and percents of pre-defined behavioral categories for each of the interpretive components.

Results

Table 1 suggests that 68% of Group A and 61% of Group B felt that the main message of the trail was associated with how animals stay alive, use their senses to survive, or need to be alert and aware of danger. This open-ended question was not applicable to the Control Group.

Responding outside of the context of the trail experience, members of the Control Group offered a wider variety of reasons for what animals do to move toward a waterhole safely. The experience of being on the trail clearly shaped the open-ended responses of both Groups A and B.

No appreciable differences were found for any of the groups which were asked about the kinds of physical evidence one might encounter that would suggest animals had failed to survive their waterhole trek.

Table 1
Visitors' Acquisition of Overall Concepts

Question 1: Based on your experience, what do you think the overall message of this trail is?

Response	Control (N=50)	Treatment A (N=54)	Treatment B (N=55)
How animals survive/stay alive	NA*	31%	15%
Animals use their senses and/or signs to detect danger/to survive	NA	20	19
Be alert, be aware of danger	NA	17	27
Subtotal		68%	61%
How animals live/behave in the wild, find food and water	NA	20	27
Miscellaneous/no response	--	12	12

*Not applicable

Question 2: What do animals do to get to and use a waterhole safely?

Response	Control (N=50)	Treatment A (N=54)	Treatment B (N=55)
Use senses/be alert/stand guard	36%	90%	92%
Use trail at night or while dark	10	--	--
Follow trail left by others	12	--	--
Use camouflage	10	--	--
Miscellaneous/no response	32	10	8

Question 3: After being on the trail, how could you tell that some animals failed to make it to the waterhole alive?

Response	Control (N=50)	Treatment A (N=54)	Treatment B (N=55)
Carcass/skull/bones/remains	80%	88%	92%
Miscellaneous/no responses	20	12	8

Table 2 indicates that two components were successful in increasing visitors' understanding of animal communication. These were the *Dangerous Droppings* and *Alarm Call* components. Twice as many visitors from the treatment groups acquired the primary message about the significance of antelope droppings as did those from the Control Group. Over three times as many visitors in Treatment Group A than in the Control Group knew how to interpret the sound of a zebra bark.

In contrast, Table 2 also shows that the higher concept that animals might be cued by others of a *different* species was not acquired by visitors.

Table 2
Visitors' Responses to Closed-Ended Questionnaire Items

Question	Number of Correct Responses Control (N=50)	Treatment A (N=54)	Treatment B (N=55)
The dung pile of a male antelope sends a message that... it will challenge antelope who enter the area.	20	44	45
% correct	(40)	[81]	[82]
A leopard will stash the carcass of its prey high above ground... to protect its dinner from scavengers.	42	51	50
% correct	[84]	[94]	[90]

If you were an animal following a trail and you saw a carcass in a tree, what would it tell you?...			
A predator may lurk nearby.	46	50	52
% correct	[92]	[93]	[95]
An animal in the wild might listen to the calls or sounds of other animal species: (three possible responses)			
— to detect danger	4	10	6
% correct	[7]	[19]	[11]
— to find out what prey animals are present	2	1	0
% correct	[4]	[2]	
— to detect danger and find out what prey animals are present	10	11	16
% correct	[20]	[20]	[29]
Some frightened animals release a musky smell that: (three possible responses)			
— confuses predators in the area	11	4	7
% correct	[22]	[7]	[13]
— warns other animal of danger	2	14	16
% correct	[4]	[26]	[29]
— confuses predators in the area and warns other animals of danger	3	2	6
% correct	[6]	[4]	[11]
An animal that hears a predator call should always run to safety. (No)	23	14	--
% correct	[46]	[26]	--
If a prey animal hears a warthog grunt, it should... keep going to water.	11	10*	--
% correct	[22]	[18]	--
	23	16	--
% not sure	[46]	[30]	--

If a prey animal hears a zebra bark, it should... run away.	13	47	--
% correct	[26]	[85]	--
	22	2	--
% not sure	[44]	[4]	--
If a prey animal hears a lion roar, it should... keep going to water	8	3*	--
% correct	[16]	[6]	--
	11	19	--
% not sure	[22]	[35]	--

* This information was not provided on the trail and was included to obtain additional baseline data.

Comparison of Treatment and Control Group data revealed that visitors already knew the main messages of the *Keeping Track of Dinner* component, and thus there was no significant effect due to the trail experience.

The *Eau de Alarm* prototype had a modest effect on visitors' understanding of the role that odor might play in confusing a predator. While 10% of the Control Group knew that a musky smell warns other animals of danger and/or confuses predators, 30% of Treatment Group A acquired this message. After modifications to the component sign, an additional six visitors (Treatment Group B) recognized that a musky smell warns of danger. The findings suggest that relatively few visitors gained a complete understanding of the intended message.

Observational data for all of the components except for *Keeping Track of Dinner* indicated that most visitors were using the components in the appropriate manner (see Table 3).

Table 3
Observed Frequency of Appropriate Behaviors for Four Prototypes

1. Leopard tracks leading to carcass

Action observed	Day 2 (N=35)	Day 3 (N=77)
Approached the sign	85%	92%
Saw the tracks	50	49
Followed tracks to carcass	4	21
Looked at sign on tree	67	63
Saw the carcass	67	61

2. Antelope tracks and dung

Action observed	Day 2 (N=35)
Approached the sign	94%
Looked at the text	94
Lifted the flap	77
Saw the dung	84

3. Alarm call interactive

Action observed	Day 1 (N=48)
Approached the sign	100%
Looked at the text	98
Chose a flap	94
Use of flaps:	
correct on first try - 36%	
incorrect on first try, tried again - 16%	
correct on first try, but tried both anyway - 31%	
unable to tell - 17%	

4. Eau de Alarm

Action observed	Day 1 (N=48)
Approached the sign	100%
Looked at the text	100
Put nose to board to smell musk	90

The *Keeping Track of Dinner* graphic was successful in attracting visitors' attention initially. Despite modifications on the third day of testing, most of visitors who eventually spotted the carcass did so by looking around. Of the 77 visitors observed, 61% found the carcass while 49% of the sample spotted the tracks and 21% used the tracks to locate the carcass.

Discussion

With respect to the first goal of the study—to discover whether visitors had acquired the primary messages of the prototype trail, the findings were encouraging. Visitors exposed to the *Thirsty Animal Trail* clearly stated that animals rely on their senses to survive their trek to the water and gained an understanding that survival requires an animal to be alert. Even though

the adult visitors showed mastery of those messages which were related to the significance of a carcass on the trail (the leopard's stash), this component was retained for younger children. The primary success of the trail was related to those `components that explained the role of olfaction in survival.

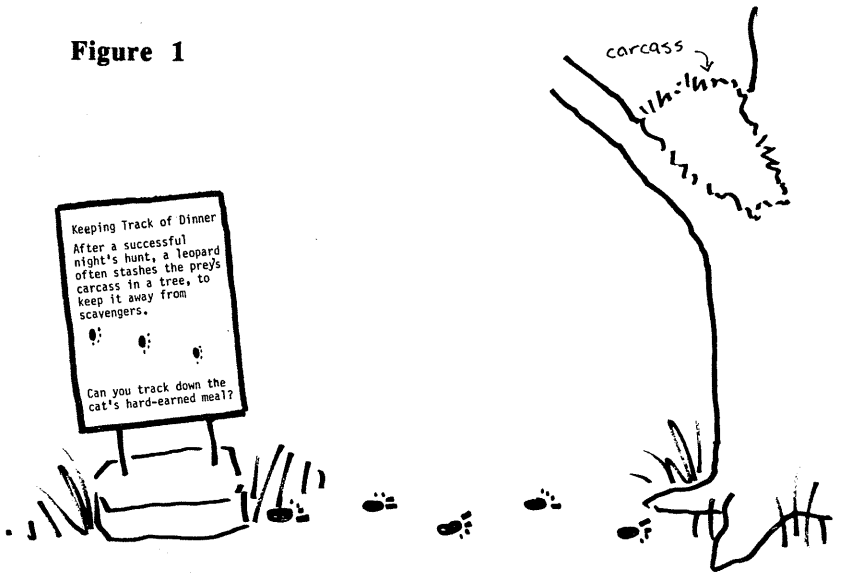
Interpretive planners were interested in increasing visitors' understanding of the role that smell plays in the various ways in which many animals communicate. Visitors may have failed to fully understand how smell can play a role in animal communication because only a small proportion acquired the primary message of the *Eau de Alarm* component. Furthermore, visitors may have interpreted the dung of the antelope as a visual cue rather than an olfactory cue. Hence, they may have acquired the subconcept that dung signals a male antelope's territory but failed to fully understand the higher concept of the role of *smell* in communication. Finally, while visitors showed a marked increase in their understanding of the correct way to interpret a zebra's bark, they did not appear to grasp the concept that animals may be cued by the signals of *other* species of animals.

The observational data showed that each component is being used in the manner in which it was intended with the exception of the *Keeping Track of Dinner* component, which had a lower success rate. It is recommended that the carcass be moved from a position behind the visitors' traffic flow, to a forward position approximately 15-20 feet from the visitors. Attention to the leopard tracks might be increased by making them very distinct and having them extend past the base of the sign and into the main trail path.

Visitors repeatedly indicated they enjoyed the trail experience. No one indicated that there were too many activities and none of the dung or bones artifacts/biofacts elicited disapproval. If anything, fascination with scatology may have contributed to the success of the *Dangerous Droppings* component.

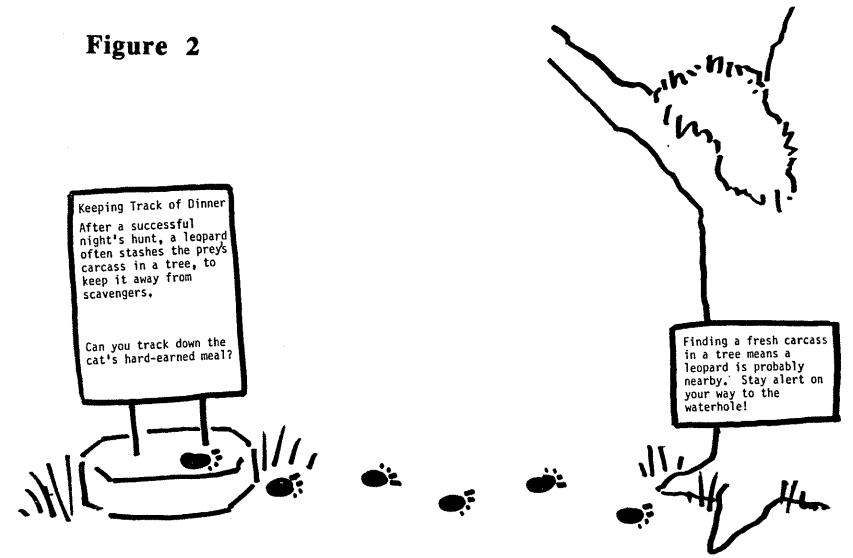
Visitors' failure to fully understand certain messages, however, should be of concern. In order to provide guided learning to their children, parents must be able to acquire and interpret the concepts presented during the trail experience. Text and design modifications should thus be directed at areas where only a partial or limited understanding of the messages was attained.

Figure 1



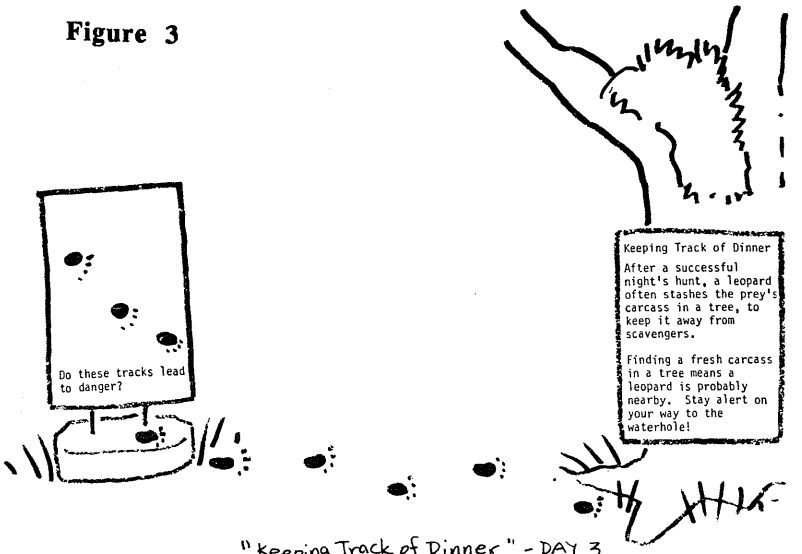
"Keeping Track of Dinner" - DAY 1

Figure 2



"Keeping Track of Dinner" - DAY 2

Figure 3



"Keeping Track of Dinner" - DAY 3

Appendix A:
Thirsty Animal Trail Exit Interview

1. Based on your experience, what do you think the overall message of this trail is?

2. What do animals do to get to and use a waterhole safely?

3. After being on the trail, how could you tell that some animals failed to make it to the waterhole alive?

4. The dung pile of a male antelope sends a message that:
   CHOOSE ONLY ONE
   A. There is water nearby
   B. It is looking for a mate
   C. It will challenge antelope who enter the area
   D. None of the above

5. A leopard will stash the carcass of its prey high above ground:
   CHOOSE ONLY ONE
   A. To signal to other leopards that it has caught the pack's dinner
   B. To protect its dinner from scavengers
   C. To attract other animals which it then kills
   D. None of the above

6. If you were an animal following a trail and you saw a carcass in a tree, what would it tell you?
   CHOOSE ONLY ONE
   A. A free meal is waiting
   B. The water is the area may be unsafe to drink
   C. A predator may lurk nearby
   D. None of the above

7. An animal in the wild might listen to the calls or sounds of different animal species:
   YOU MAY CHOOSE MORE THAN 1 ANSWER
   A. To detect danger in the area
   B. To locate a possible mate
   C. To find out what prey animals are present in the area
   D. To locate their young
   E. All of the above

8. Some frightened animals release a musky smell that:
   YOU MAY CHOOSE MORE THAN 1 ANSWER
   A. Attracts members of their group to their defense
   B. Confuses predators in the area
   C. Warns other animals of danger
   D. Poisons predators
   E. All of the above

9. Is there anything about this trail you would change?

Appendix B:
Thirsty Animal Trail Interview

In Africa, waterholes provide a necessary resource for living things. Around waterholes areas, fascinating interactions occur among predator and prey animals who go to the waterhole to drink.

1. What do you think animals do to get to and use a waterhole safely?

2. After following a trail to the waterhole, how could you tell that some animals failed to make it there alive?

3. Easy to spot on the trail, the dung pile of a male antelope sends a message that:
   CHOOSE ONLY ONE
   A. There is water nearby
   B. It is looking for a mate
   C. It will challenge antelope who enter the area
   D. None of the above

4. A leopard will stash the carcass of its prey high above ground:
   CHOOSE ONLY ONE
   A. To signal to other leopards that it has caught the pack's dinner
   B. To protect its dinner from scavengers
   C. To attract other animals which it then kills
   D. None of the above

5. If you were an animal following a trail and you saw a carcass in a tree, what would it tell you?
   CHOOSE ONLY ONE
   A. A free meal is waiting
   B. The water is the area may be unsafe to drink
   C. A predator may lurk nearby
   D. None of the above

6. An animal is the wild might listen to the calls or sounds of *different* animal species:
   YOU MAY CHOOSE MORE THAN 1 ANSWER
   A. To detect danger in the area
   B. To locate a possible mate
   C. To find out what prey animals are present in the area
   D. To locate their young
   E. All of the above

7. Some frightened animals release a musky smell that:
   YOU MAY CHOOSE MORE THAN 1 ANSWER
   A. Attracts members of their group to their defense
   B. Confuses predators in the area
   C. Warns other animals of danger
   D. Poisons predators
   E. All of the above

   CHOOSE THE CORRECT ANSWER
8. An animal that hears a predator call should always run to safety.
   YES NO NOT SURE

9. If a prey animal hears a warthog grunt, it should:
   RUN AWAY KEEP GOING TO WATER NOT SURE

10. If a prey animal hears a zebra bark, it should:
    RUN AWAY KEEP GOING TO WATER NOT SURE

11. If a prey animal hears a lion roar, it should:
    RUN AWAY KEEP GOING TO WATER NOT SURE