

AN INVESTIGATION OF SLOTH BEAR (*MELURUSUS URSINUS*) CUB DEVELOPMENT
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INTRODUCTION

Little information about sloth bear (*Melursus ursinus*) cub development has been reported either from the wild or captivity. When a sloth bear cub was born in January 2006 at the Smithsonian's National Zoo we decided to conduct a behavioral study in order to learn more about cub development. We were interested in how a typical sloth bear cub spends its time and how that time budget changes as the cub matures. We were also interested in how dependent sloth bear cubs are on their mothers and how quickly that changes as they mature.

To conduct this study, we developed an ethogram of sloth bear cub behavior. Observations of the cub took place over two different phases during which a group of trained volunteer behavior watchers collected data. Data collection in Phase I began with the cub's debut on exhibit at 4 months old and continued until he was 8 months old. A four month break from data collection occurred between phases while the zoo's 3 sloth bears were moved into a brand new exhibit and given a chance to settle in. After the bears had acclimated to the new exhibit, Phase II of data collection began; the cub was 12 months old at the start of this phase which ran until he was 18 months old.

We hoped this study would provide some insight into our questions about a sloth bear cub's time budget and maternal dependence, and perhaps provide other zookeepers with a general idea of how a sloth bear cub spends its time over the first year and a half of its life. This information could also prove useful in comparative studies between different species of bears.

METHODS

Phase I

- Developed & tested an ethogram of sloth bear cub behavior

Sloth Bear Cub Development Behavior Watch 2006	
<ul style="list-style-type: none"> - Each shift (data collection session) is 2 hours in length. The sloth bear cub is the focus of observations. - Thirteen behaviors, activity level, and proximity to the mother will be recorded using <i>instantaneous scan sampling</i> at two-minute intervals. When the stopwatch beeps at the end of two minutes, the cub's behavior, activity level, and proximity to his mother is recorded. One activity level, one distance category, and one behavior should be checked for each interval. - Additionally, six behaviors will be recorded using <i>all-occurrence sampling</i> (in other words, each time they occur). Please record the time and place a check in the appropriate behavior box. - Use comment fields to note any specifics about the behaviors that seem important, such as the object being played with, food being eaten, structure being climbed, number of body lengths away from mother, etc. Also use it to explain the categories "other" and "not visible" (if you know where they went, for example). Additionally, please note when cub is on the hammock or log structures (for example, if he's playing or resting in the hammock, mention the hammock in the comments). 	
The following are the behaviors for <i>instantaneous scan sampling</i> :	
Behavior	Definition
Sleep	resting with eyes closed, exhibiting little or no movement
Eat	manipulating food in mouth (includes licking food off of an object or substrate); note food item in Comments field if you know what it is
Forage	investigating, sniffing and/or digging interspersed with eating (typically nose to the ground, rockwork, or log with sucking, blowing, chewing, etc.)
Nurse	positioned with mouth attached to mother's teat (often accompanied by "trilling" vocalization)
Alert	eyes open responding to environment or possibly looking around (can be stationary or locomoting; ex. alert locomote = walking or running)
Dig	using claws to move substrate or shred logs (ie. power digging w/ intensive activity)
Climb	ascending/descending fixed structure (such as a tree or wall) using front claws to pull self up or lower self down, with intent to change elevation
Explore	engaged in olfactory or other exploration (sniffing, licking, gnawing/biting non-food objects etc.); includes purposeful manipulation
Maternal Play	engaged in playful interaction with mother (wrestling, biting, chasing, roughhousing)
Play Alone	animated rolling, running, jumping, hanging/dangling, biting of own feet, or otherwise entertaining self
Play with Object	engaged in animated manipulation with detached natural (stick, grass clump, etc.) or unnatural (box, ball, etc.) object; note object in Comments field
Other	any behavior that does not fit into another category; note behavior in Comments field
Not Visible	out of view of watcher; note in Comments field if you know where cub is (i.e. stairwell "LS" or top level "T3" behind foliage) & if rain or other condition may be causing cub to stay out of view
Activity Level	
Locomote	engaging in forward, reverse or sideways motion; body must change location
Stationary	not engaging in forward, reverse or sideways motion; body remains in same location (even if limbs are moving)
Proximity	
Ride	being transported with weight fully on mother
Full Contact	positioned so that weight is fully supported by mother
Partial Contact	touching or atop mother with weight partially or fully distributed to ground, structure or object
Close Proximity	proximity to mother is equal to or less than the length of mother's body
Out of Reach	proximity to mother is greater than the length of mother's body; estimate number of body lengths in Comments field
The following are the behaviors for <i>all-occurrence sampling</i> :	
Behavior	Definition
Fall in Moat	falls off edge of exhibit and into moat; note in Comments from where the fall occurred
Fall from Other	falls out of a tree, hammock, or other structure (excluding falling into moat from exhibit edge); note in Comments from where fall occurred
Engage with Neighbor	at edge of exhibit oriented towards bear in neighboring yard; note in Comments which bear is in neighboring yard
Groom Self	lick or nibble at own fur, to remove dirt and debris or to dry off; may also include combing own fur with claws (if clearly distinguishable from scratching)
Groomed by Mother	mother grooms cub
Groom Mother	cub grooms mother
- A behavior recorded using <i>all-occurrence sampling</i> must cease for at least 1 minute or be interrupted by another behavior before it is recorded again.	

- A total of 490 hours of data were recorded

Phase II

- Behavior watchers recorded the cub's activities during 2 hour observation shifts
- 1-2 observation shifts occurred approximately 3x/week between January 2 and July 26, 2007 (fewer observations in February due to cold weather preventing bears from being on exhibit)
- Behaviors were recorded using instantaneous scan sampling at 2 minute intervals (as in Phase I)
- A total of 234 hours of data were recorded
- Data from both phases of the study were analyzed for trends showing cub development over time.
- Related behaviors were combined for analysis: eating + foraging and maternal play + play with object + play alone.

RESULTS

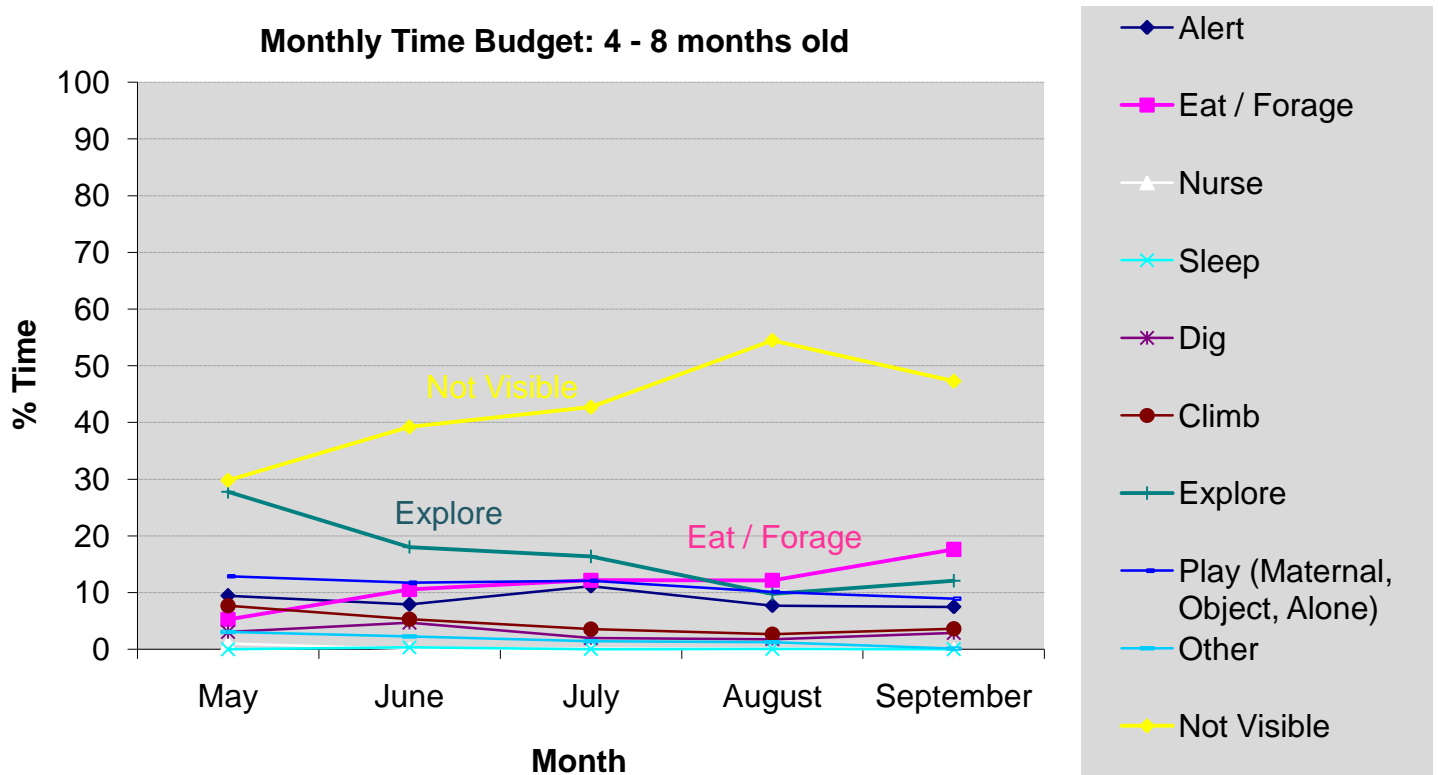


Fig. 1. An increase was seen in the amount of time the cub spent foraging and eating between 4 and 8 months of age.

Monthly Proximity: 4 - 8 months old

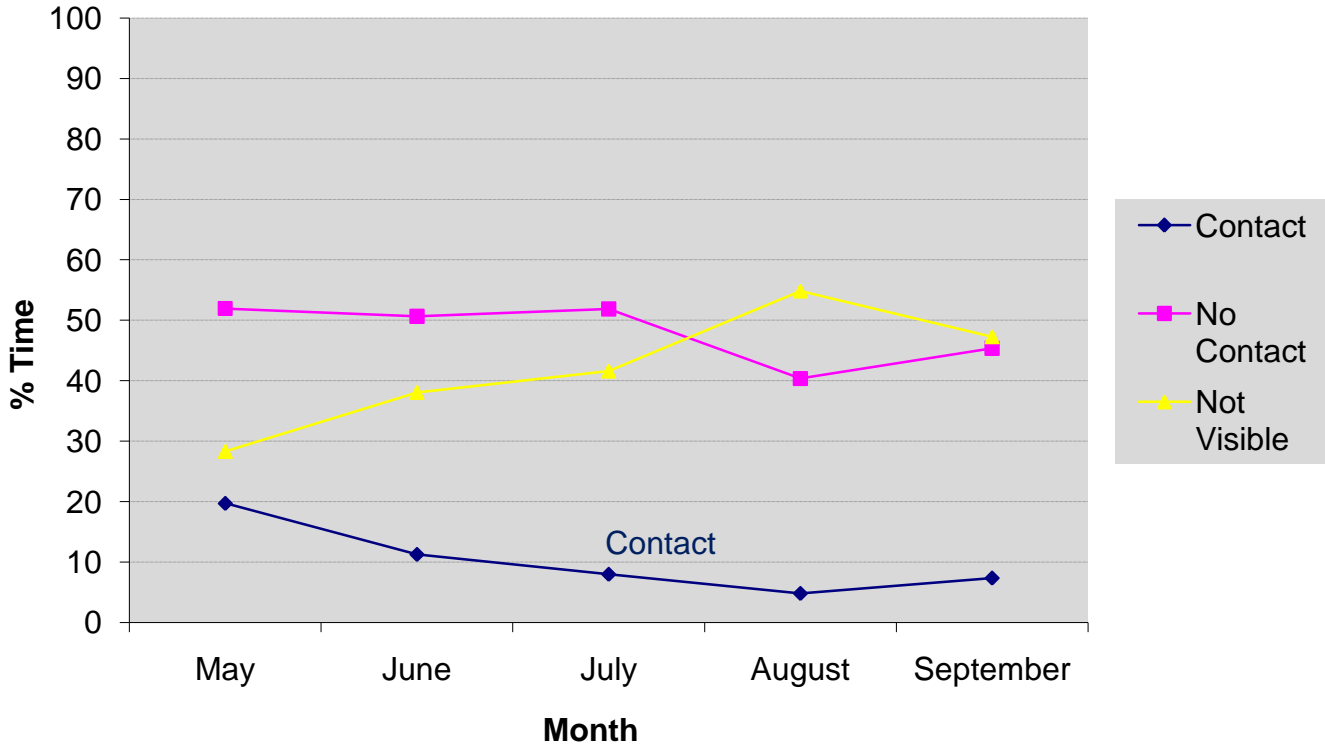


Fig. 2. A decrease was seen in the cub's physical contact with his mom between 4 and 8 months of age.

% Time Spent Riding on Mom's Back: 4 - 8 Months Old

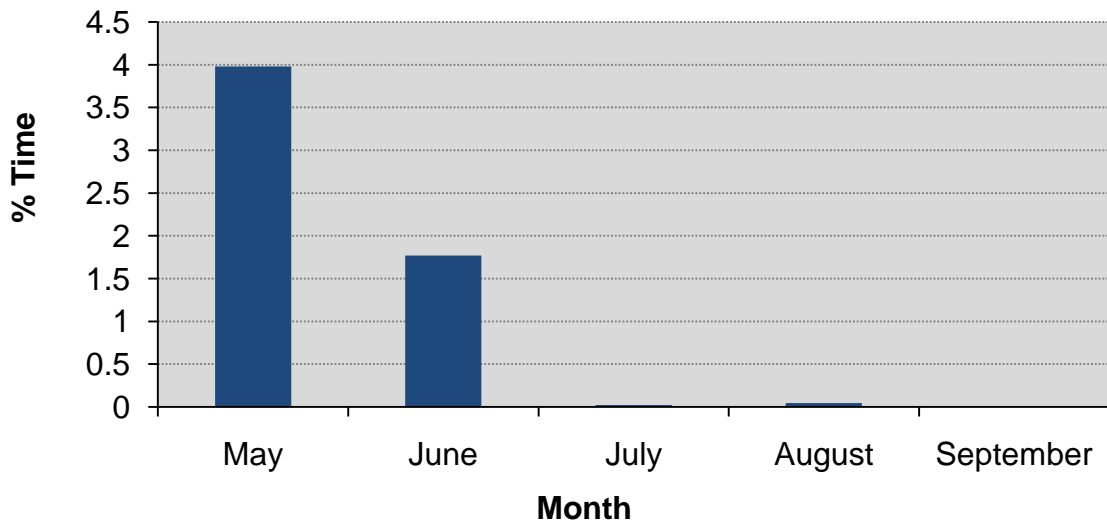


Fig. 3. Riding on mom's back was rarely seen after the first 2 months of the study (4-5 months old) and had ceased by the 5th month (7 months old).

Average # of Falls per Hour: 4 – 8 Months Old

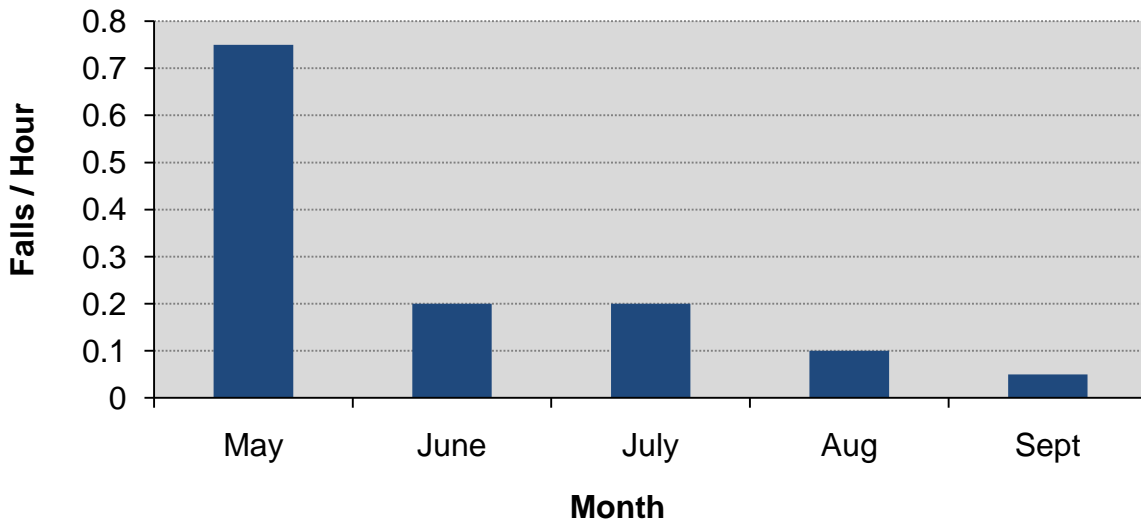


Fig. 4. There was a decrease in the amount of falls the cub had from trees or other structures.

Unfortunately, the study did not reveal much more about cub development due to a major factor interfering with data collection - places in the exhibits where the bears could not be viewed. As a result of this confounding factor, a correlation was found between behavior and weather; the bears spent most of their time out of view when it was hot or raining (see Fig. 1 & 5).

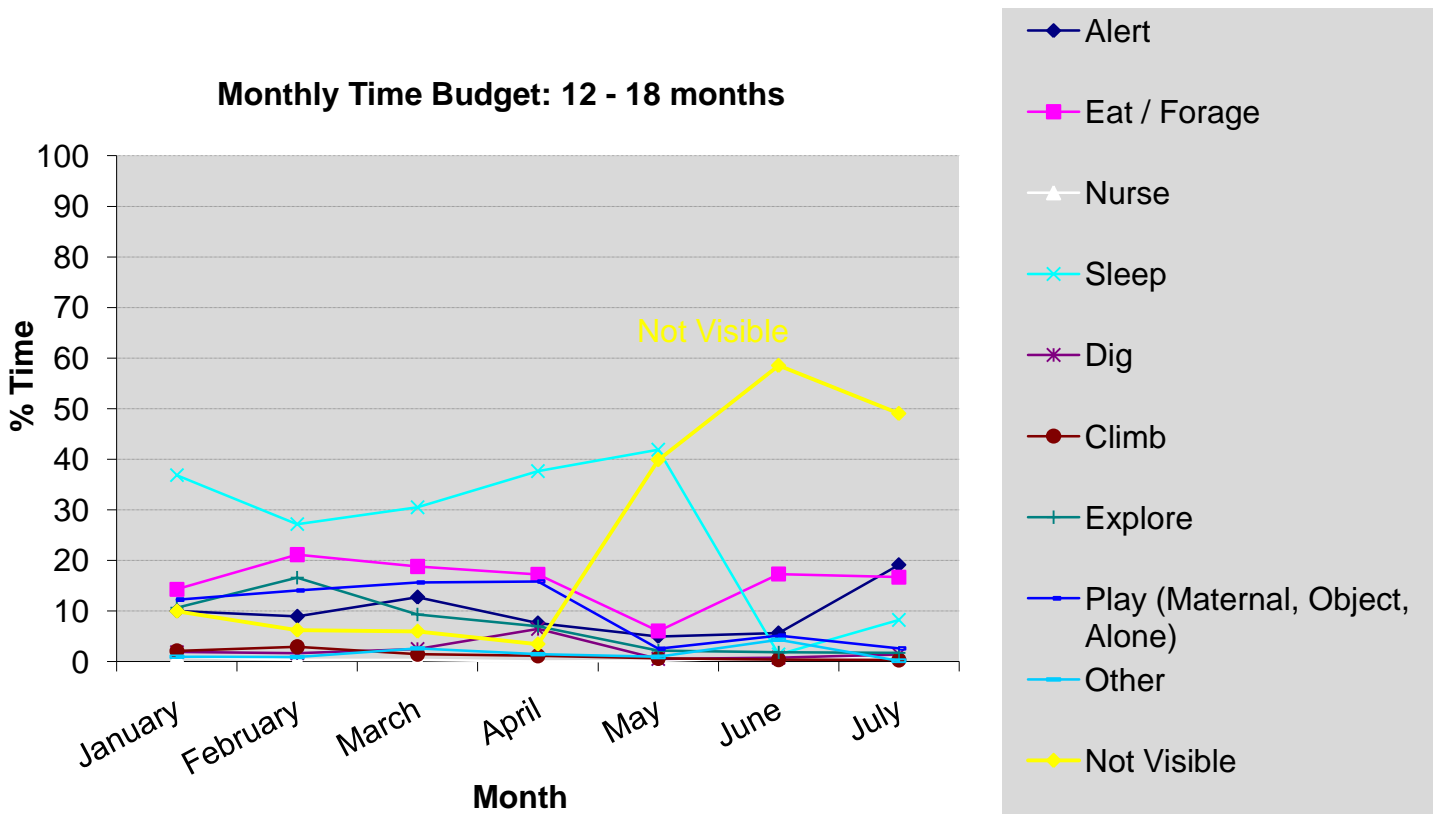


Fig. 5. Correlation between temperature & time not visible.

DISCUSSION

Due to frequent limited visibility of the bears, it was not possible to analyze all of the study objectives. The most interesting results came from Phase I of the study when the cub was 4 – 8 months old. As expected, we saw an increase in eating and foraging over the first 5 months of the study. This increase may correlate with the decrease seen in exploring; as the cub started eating solid foods, more time was spent foraging instead. We also saw a decrease in the cub's physical contact with his mother and a decrease in his falls.

Not surprisingly, we learned that the bears seek shelter from the hot sun and from the rain, as well as for privacy while nursing. During Phase I, the bears spent an increasing amount of time hiding in the stairwell leading to their dens, mainly when it was hot or raining. It appears that most of the nursing also occurred in this area out of view. During Phase II, after the bears had moved to their new exhibit, they sought shelter in the doorway to the chute leading to their indoor enclosure when it was hot or raining. There were other areas in both the old and new exhibits where the bears were out of view from the watchers (i.e. behind overgrown foliage). This was especially the case in the new, much larger exhibit which may explain why data from Phase II of the study revealed little in terms of developmental trends.

Despite the minimal results, we gained valuable information to consider in the design of future studies. In the future we plan to conduct observations in off-exhibit areas where the bears are more easily viewable to minimize data loss due to the bears not being visible. With a new cubbing den and updated equipment, we should also be able to record behavior from the cub during the time it is still in the den. This may provide more comprehensive developmental data since cubs develop significantly during the first few months of life. We also hope to conduct this study with our spectacled bears when they produce a cub, and use this data as a comparison with the sloth bear cub.

ACKNOWLEDGEMENTS

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