Reaching Out for Enrichment

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Enrichment can improve the physical and psychological health and fitness of captive animals (Shepherdson, 1998). In order to achieve these objectives, enrichment techniques must be challenging as well as meet the requirements of animal safety (Duncan, 1997). Thus, keepers must understand the physical capabilities of their animals in order to provide the best possible enrichment for them.

Malayan flying foxes (Pteropus vampyrus) demonstrate *remarkable arm strength and dexterity.*

The Lubee Foundation, Inc. houses a large and unique collection of Old World fruit bats, mammals that benefit from enrichment in captivity (LeBlanc, 1999). Bats have powerful physical adaptations for flight. The wings of fruit bats have a well-developed but lightweight bone structure, robust muscles, and a tough patagium, or wing membrane. The rear legs are specially adapted to allow the bat to hang upside down without using any energy. Old World fruit bats utilize their thumbs, wings, and legs to climb, grab, and manipulate objects. They also use these appendages for thermoregulation, self-defense, and for supporting the weight of their young. Bats also have an unusual behavior in which they invert themselves by hanging from their thumbs to remain clean while defecating. Therefore, from an early age, the thumbs of Old World fruit bats must be strong enough to support their body weight.

In order to challenge the fruit bats at the Lubee Foundation, Inc., the staff have hung plastic chains vertically in the enclosures and attached various fruits and vegetables. The bats hook the chain and reel it up, thumb-over-thumb, to obtain the reward. This behavior simulates how these bats would obtain fruit from the end of small branches in their natural environment. After observing how the bats utilize the chains, several questions remained. How much could these bats lift, are males stronger than females and how could the staff modify this technique to learn more about the bats' feeding behavior?

A simple preliminary project was initiated to study how much Malayan flying foxes *(Pteropus vampyrus)* could lift. A custom-made weight of stainless steel washers was used, since it was easy to modify and disinfect. This weight was suspended from a plastic chain that was one meter in length. A variety of food items were attached to the chain, and it was hung from a shower curtain ring that was 5 cm above the weight. The entire device was weighed in grams, and hung from the ceiling of the enclosure near the target bat.

A lift was determined to be successful when the bat lifted the chain high enough to consume the food. After each successful lift, the weight was increased until the bat was incapable of lifting the weight. After the trials were performed, each bat was weighed. The percent of body weight lifted was calculated by dividing the weight lifted by the body weight of each bat.

The results of this preliminary study were interesting, with a group of 4.9 Malayan flying foxes *(Pteropus vampyms)* lifting on average 57% of their body weight. The females in this study generally lifted a smaller percentage of their body weight than the males, but this difference needs. (Assessing strength in exotic animals can be difficult because the results can easily be con-founded by animal motivation.) The greatest percentage lifted by any bat was by a two-year-old male, which was able to lift 76% of his body weight.

The data in this preliminary study show the incredible arm strength of these unique flying mammals. With this knowledge, new enrichment ideas can be developed and old ones altered to enhance the way the bats use their arms.

A note on safety: When designing enrichment for bats, it is important to remember to keep

flyways clear, and to make sure that enrichment items are secure.

References

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