



Lubee Bat  
CONSERVANCY

# Lubee News

Fall 2005

## Community Notes and Calendar of Events

**July 16th: Gainesville Business donate Browse Garden to Lubee. Our thanks to:**

Barr Nursery LLC

Grandiflora Nursery (formerly San Felasco Nurseries)

Harmony Gardens

West Farms

Willis Nursery

Wildflowers of Florida, Inc.

Alachua County Master Gardeners

**August 25th:** Florida Museum of Natural History—Museum Nights. Lubee presentation at 5:30pm

**September 25th:** Alachua County Library; Newberry Branch. Lubee presentation at 2:00 pm

**October 22nd:**

Lubee Bat Festival; 1pm-4pm

**December 3rd:**

Florida Bat Working Group Meeting at Lubee

**January 2006**

AZA/ Bat TAG Mid-Year Meeting hosted by Lubee.

More information about the presentations, as well as scheduling can be found by emailing us at [info@lubee.org](mailto:info@lubee.org)



Photo Courtesy of Pam Thomas

## RETURN TO FLIGHT: AN ESSENTIAL FORM OF ENRICHMENT FOR OLD WORLD FRUIT BATS

At the Wildlife Conservation Society International Conference on Environmental Enrichment held in New York this past August, animal keepers and researchers from around the world gathered to share their research and ideas. Lubee's senior keeper Sarah Purcell presented her work on obesity in captive bat colonies: "Return to Flight: An Essential Form of Enrichment for Old World Fruit Bats" at the conference. The project was co-authored by Sarah Purcell, Pam Thomas, Dana LeBlanc, and Allyson Walsh.

### Introduction

Bats are unique among mammals in their ability to fly. Most bats maintained in zoos are highly social and have to be kept in groups (colonies). Maintaining colonies of bats in captivity demands husbandry practices to give them enough space to permit sustained flight, minimize enclosure risks that could lead to wing injuries, and to manage their food intake and activity level to avoid obesity. Obesity in captive bat colonies is a concern because bats that are obese lose the ability to fly and become more obese. One particular problem in managing a group, is that the most dominant animals tend to gain greater access to food (and roosting positions etc.), leaving them more prone to obesity. At Lubee, we have designed circular cages with few obstructions to enable bats to maintain flight and avoid injury. In this environment, we tested husbandry methods to control individual's weights in a colony, and allow/encourage previously non-flighted individuals to fly again. We mixed fruit bat species to increase food competition, resulting in a reduction of body weight in targeted individuals. We increased exercise by offering novel enrichment items such as weighted plastic chains to get non-flighted individuals back into the air flying.

### Methods

Enclosure design is a major factor in keeping bats flighted. Most zoos use rectangular cages, permitting bats to fly from one end to the other, which usually results in bats landing at either end and maintaining flight for only a short duration. The enclosures at Lubee Bat Conservancy are a unique octagon shape, with a central night house, allowing the bats to circle the enclosure in continuous flight and completing as many circuits as they want (Seyjagat 1994). The state of Florida requires that caging be a minimum of 1020 square feet to house 12 bats with wing spans greater than 3 feet. At Lubee, the enclosures are 1087 square feet (with a 121 square foot night house) and contain landing ropes around the edge of the enclosure, but no other obstructions such as tree branches. Weight control and returning bats to flight

can be achieved by combining three key methods: mixing of species, enrichment and flight simulation. We selected seven overweight *Pteropus hypomelanus* and seven overweight *Pteropus pumilus*, and combined all three methods to reduce their weight to the average weight range for the species and get them back to flight. All bats were female, since the females have the



Photo: Pam Thomas, Lubee

greatest problems with obesity.

### 1. Mixing Species

Species mixing can increase competition for food in an enclosure. We added dominant obese bats (*Pteropus pumilus* and *Pteropus hypomelanus*) to a pen of larger animals (*Pteropus vampyrus*), where the bats were no longer the dominant animals. The obese bats then had to compete for food, and as a result, consumed a lower quantity of food.

### 2. Enrichment

A variety of enrichment techniques can be used to reduce food intake and increase muscle activity. We used the following:

Weighted chains with food items at the ends encourage bats to use of their arms and build muscle that can atrophy when the animal is non-flighted. A prior study at Lubee showed bats can lift at least half their body weight on a weighted chain (Sequin *et al* 2004).

Ladders and logs with food or other items (reflectors, mirrors, scented items etc.) encourage climbing and arm use also.

Foraging for their food can increase the amount of energy used. By placing larger items of food from the diet around the enclosure, the bats must search for their food instead of easily finding it in one central place. When using food enrichment it is essential to make sure that the equivalent quantity of food is removed from the normal diet, to avoid over feeding the animals. Also, the use of lower calorie foods such as celery, lettuces, is helpful (LeBlanc in prep).

### 3. Flight Simulation

Simulating the wing-flapping of flight is valuable to help bats build muscle and encourage a return to

("Return to Flight" continued on pg 2)

## (cont. from p1 "Return to Flight")

flight. We simulated the wing-flapping of flight by holding the bats by their feet and swinging the bat gently. The bat then instinctually flaps its wings, using muscles that it does not use when only crawling/walking.

**Results**

We found that a combination of mixing species, enrichment and flight simulation can be used to successfully produce weight loss in animals managed in a group setting and return them to flight condition.

Weight loss to a target weight range of 550-600g for *Pteropus hypomelanus* was reached in 7 out of 7 bats (Graph A & B), and to a target weight range of 215-235g for *Pteropus pumilus* in 6 of 7 bats (Graph C & D). All individuals, except one *P. pumilus* "Bing", regained the ability to fly. Some individuals, even after substantial weight loss, did not regain their ability to fly right away and needed to build up muscle. It appeared to take the *P. pumilus* longer to lose weight than *P. hypomelanus*. Our findings demonstrated that weight gain can occur just as rapidly when bats are returned to the group settings that caused their original weight gain. An example is "Helen", a female *P. hypomelanus*. (average wingspan 3.5 ft) She was moved from her enclosure, along with three other obese *P. hypomelanus* bats, to an enclosure of *P. vampyrus* (average wingspan 5 ft). She began at a weight of 950g on 18 November 2004 and lost on average 6.6g a day for 56 days. At her new healthier weight (578g), she was moved to a breeding colony and was able to fly. On 10 March 2005 she was weighed again and was had gained an average of 3.5g per day over a period of 57 days. Weighing in at 780g, and now being non-flighted, she was moved back to the weight loss pen. There she lost weight at a rate of approximately 8.14 g per day for 14 days. She was then moved back to the breeding colony and is now pregnant.

**Discussion**

From a captive animal health perspective, balancing adequate nutrition and exercise to avoid obesity is a primary management goal. Obesity

in bats appears to affect females to a greater extent than males, and is a long term management problem. This could be explained by two hypotheses. First, females may use less energy than males on a daily basis in defending their status in the dominance hierarchy (males exhibit greater sparing behavior). Second, we have observed females putting on weight prior to pregnancy. In the wild, females breed annually, but in captivity our bats are not bred every year, possibly leading to excess weight gain. Obesity may lead to long-term health problems, which in bats can include the loss of flight. Additionally, we have observed that obesity may interfere with females getting pregnant and in nursing their pups, as layers of fat prevent the pup from finding the nipple. The results of this study show that long term weight management of bats thru mixing species, enrichment and flight simulation can be used as a long term strategy for managing weight in individuals prone to obesity. However the AZA Bat Taxon Advisory Group husbandry guidelines advise mixing species from the same geographic region. Further studies of interest would be to assess annual fluctuations in weight, and the incidence of long term health problems related to weight gain, such as diabetes.

**Conclusions**

Weight loss and return to flight is an achievable short-term management goal. Losing weight does not always result in gaining the ability to fly. Some animals are less motivated and walk/crawl around the enclosure. Getting the weight off is easier than keeping it off. Bats are managed and fed as a cohesive group or colony, making it difficult to closely monitor or restrict individual food intake. Individual bats prone to obesity can be managed by maintaining them in a mixed species setting, enrichment and flight simulation. Weight control requires a long-term management approach and is, as for many humans, a constant battle.

**References**

LeBlanc, D. (In Preparation). "Environmental enrichment for long term captive bats".

*Bats in Captivity*. Editor: S. Barnard. Malabar, FL., Krieger Publishing Company  
Seguin M, LeBlanc D, Cruz M, Rosenberg A, March C, Poppell P, Dampier L. 2004. "Reaching out for enrichment". *The Shape of Enrichment*. Vol. 9 No. 4, 8-9.

Seyjagat J. 1994. "Principal Aspects of Enclosure Design for Flying Fox". *1994 AZA Regional Conference Proceedings*. P.158-159.



Left: Obese "Jaynee" 0.1 *P.pumilus*  
Weight= 400g

Right: "Jaynee" at 240g



*Eidolon helvum* at Lubee. Photo courtesy of Pam Thomas

## Lubee Bats Help Test Radio Tracking Collars

Every fall, one of the world's largest migrations takes place in Kasanka National Forest in Zambia. Approximately 8 million Straw-colored Fruit Bats (*Eidolon helvum*) congregate within a few square miles and stay from mid-October through January every year. No one knows where they all come from or where they go when they leave. Lubee is supporting research by PhD student and former Lubee volunteer, Heidi Richter in order to learn more about this amazing migration, using satellite radio tracking devices.

Past research conducted by Richter and her University of Florida supervisor Dr. Graeme Cumming in Kasanka examined the role of food availability on this migration, demonstrating that the bats do indeed congregate at a time of high local food abundance. Now she hopes to track the bats' long distance movements as they feed and travel away after their stay in the park, following their migration routes and discovering where the bats spend the rest of the year.

Before she can do that, however, the radio tracking devices

are being tested on Straw-colored Fruit Bats at Lubee in order to ensure that the devices are comfortable and safe for the bats to wear, and functional. So far, the Lubee bats have provided valuable data to improve the harness design, giving Richter's project a higher chance of success in the field. This collaboration between Lubee's field projects and center research not only gives the researcher a better chance of succeeding, but also provides Lubee staff with the opportunity to use their knowledge of captive bat husbandry to help conservation efforts in the wild.

## *Pteropus vampyrus* Chosen as One of Nine Mammals for Genome Sequencing Project

In an effort to better understand the human genome and the evolutionary changes it has undergone, the National Human Genome Research Institute (NHGRI) has chosen nine mammal species as well as 4 non-mammalian species for its Large-Scale Sequencing Research Network. Among the mammals chosen are two bats: a megabat (*Pteropus vampyrus*) and a microbat (*Microchiroptera* species). Lubee has been asked to provide the specimen for the *Pteropus vampyrus*. The other seven mammals chosen are the 13-lined ground squirrel (*Spermophilus tridecemlineatus*), the tree shrew (*Tupaia belangeri*), the bushbaby (*Otolemur garnettii*), the hyrax (*Procavia capensis*), the pangolin (*Manis species*), the Northern white-cheeked gibbon

(*Nomascus leucogenys*), and the sloth (*Bradypus* or *Choloepus* species). The non-mammalian species chosen include the M and S strains of a malaria carrying mosquito (*Anopheles gambiae*), a roundworm (*Heterorhabditis bacteriophora*) and a zebra finch (*Taeniopygia guttata*).

Through a combination of whole genome sequencing, genome mapping, and sequencing of particular genomic regions, researchers hope to gain a better understanding of the human genome as well as the of evolutionary biology of genomes. Scientists believe that most segments of the human genome developed before humans themselves. Recent multi-species comparisons and analysis by the NHGRI found that the

rate of chromosomal evolution among mammals increased significantly following the extinction of the dinosaurs 65 million years ago. It is believed that the events that caused the mass extinction also created new ecological niches for mammals, leading to their further diversification and the development of species specific chromosomes. Comparing the genomes then of mammalian and non-mammalian species to the human genome may provide some insights into how and when the human genome developed as it did. "Comparative genomics has proven to be one of the most effective strategies for revealing the important structural and functional elements of the human genome sequence," said NHGRI Director Francis S.

Collins, M.D., Ph.D. in a recent press release by the NIH.

Other comparative genomic studies have found that rather than being random, chromosomes tend to break in the same places as species evolve. They also found that chromosomal abnormalities associated with cancer are far more likely to occur in these breakages. Researchers believe that the breakages may activate genes that trigger cancer or inactivate those that suppress cancer.

Work on the sequencing of these 13 additional species will be carried out by NHGRI supported institutions. More information about the project can be found by visiting the NHGRI's website at [www.genome.gov](http://www.genome.gov).

### Did You Know?

Vampire bats and New Zealand Short-tailed Bats both have physical adaptations that allow them to move along the ground, running, climbing and even burrowing. Evolutionary adaptations, including an unusual folding process along the forearm allows the wing to be used as a normal forelimb in walking and climbing. The New Zealand Short-tailed bats, *Mystacina tuberculata*, and *Mystacina robusta*, have been known to burrow for grubs, as well as to eat flying insects, fruit, nectar, and pollen. Both species of New Zealand Short-tailed bats have declined in population numbers through loss of habitat, predation by rats and other introduced mammals, poisoning, and human disturbance. At the moment, *M. tuberculata* is listed by the IUCN as vulnerable, and *M. robusta* as extinct.

### Join Us at Lubee for our Annual Bat Festival October 22nd, 2005!

Come and see the largest collection of Old World Fruit Bats anywhere in the world.

All ages are welcome. Admission is free, but donations are always appreciated.

Enjoy a unique experience touring our Tropical Fruit Bat Conservation Center. Lubee is a one of a kind facility housing the largest collection of Old World Fruit Bats anywhere in the world. Learn about their environmental role in rainforest preservation as well as the challenges facing them in the wild. Learn about native Florida bats, how to build a bat house, and more about our unique local ecology. There will be crafts for the kids, t-shirts and photographs for sale, and lots to see and learn. Bring your cameras for this unforgettable experience!



Photo Courtesy of Pam Thomas

#### Tentative Schedule

**10/21- Friday Evening** (at UF Bat House, across from Lake Alice.)

7:15 pm- "Bat Banter" presentation- learn about Florida's native bats.

**10/22- Saturday Afternoon** (at Lubee)

1:00 pm- Gates Open

1:45 pm- Presentation on "The Lives of Bats"

3:00 pm- Presentation on "The Bounty of Bats"

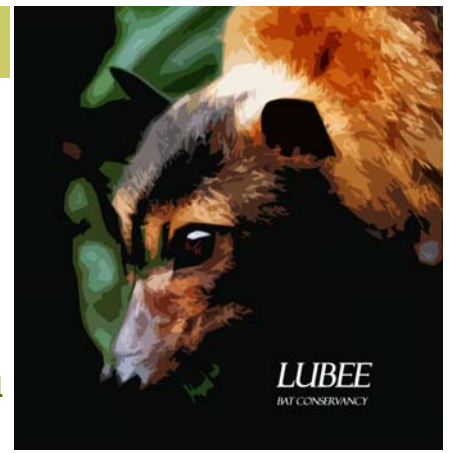
4:00 pm- close

Tables/educational displays include: Florida Wildlife Federation, Florida Bat Working group and others to be confirmed.

# LUBEE BAT CONSERVANCY

## Saving Bats Conserving Ecosystems

**Lubee Bat Conservancy is an international non-profit organization working with others to save fruit and nectar bats and their habitats through conservation, research, and education. Healthy ecosystems depend on fruit and nectar bats that pollinate flowers and disperse seeds. These bats are among the least studied and most threatened in the world. Lubee is working to promote understanding and responsible management of the vital relationship between bats, plants, and people, leading to a sustainable future for all.**



### The Challenge

Fruit and nectar bats visit plants for their food and are vegetarians. While feeding they perform important ecological functions for the plants, sharing the role of seed dispersal and pollination with birds and insects. In rainforests, these bats play a vital role in forest regeneration and the maintenance of forest diversity. In some island countries, they are often the only native mammal and are of cultural and economic importance to local people dependent on natural forest for protection, water, timber, and other forest products.

It is estimated that more than 134 plants that yield products used by humans are entirely or partially reliant upon bats for seed dispersal or pollination. Fruit & nectar feeding bats are important pollinators of many wild as well as agricultural plants such as mangoes, cashew nuts, figs and columnar cacti in the desert Southwest of North America.

Over half of the bat species on our planet are considered threatened or near threatened with extinction. Flying foxes, like the one pictured here, are one of the most persecuted of all wildlife groups. Culled as crop-pests, hunted for food, and losing the habitats that they live in and support, fruit bat populations are disappearing at an alarming rate. Their loss is our loss.

### Our Approach

We work with a world-wide team of conservation scientists, educators and zoological institutions.

We link field studies with our premier center for bat conservation, research, and training.

We build capacity of communities to conserve fruit and nectar bats and their essential ecosystem services through education and outreach.

### How You Can Help

For more information about Lubee or to receive information about our local Florida education outreach program, *Nocturnal Adventures*, please email us at [info@Lubee.org](mailto:info@Lubee.org). To make a donation, log on to our website at [www.Lubee.org](http://www.Lubee.org) and click on "Join Us" or mail in your membership form below to:

Lubee Bat Conservancy  
1309 NW 192<sup>nd</sup> Ave.  
Gainesville, FL 32609

------(tear here)-----

**Yes, I would like to become a member of Lubee Bat Conservancy. Enclosed please find my gift of**

- \$25
- \$35
- \$50
- \$100
- (other) \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

Phone \_\_\_\_\_

Email (to receive newsletter) \_\_\_\_\_