

# Promoting Fruit

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# Bat

## Conservation

through Education

in Madagascar

**The Association of Zoos and Aquariums (AZA) Bat**

**Taxon Advisory Group (Bat TAG) works to promote bat**

**conservation in both zoo-based programs as well as**

**in wild habitats. Education to raise awareness of the**

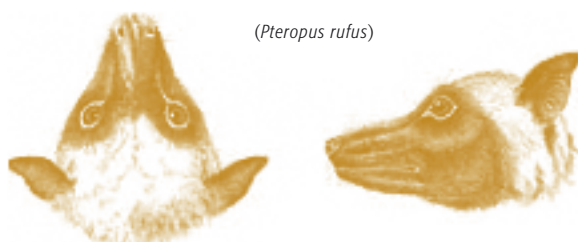
**critical ecological role that endemic fruit bats play in their**

**environment is a high priority strategy for the Bat TAG.**

We first developed a bat education kit and curriculum for Rodrigues in 1995, to educate local students about the endangered Rodrigues fruit bat *Pteropus rodricensis* (Trehwella *et al.* 2005). Evaluation results demonstrated the students' knowledge gain and increased awareness about these bats, and the bat education kit became a model for future education programs. Yet, our experience on Rodrigues confirmed that of others working in field conservation education: sustaining programs beyond initial involvement depends on having a consistent presence in the field. In Rodrigues this was achieved by recruiting a conservation educator for the project and establishing close links with the Mauritian Wildlife Foundation (Trehwella *et al.* 2005). This suggests that creative partnerships with other conservation groups already working in the country provide the best opportunity for sustaining the activities and maximizing the impact of conservation education programs.



Several of Madagascar's populations of wildlife species are dwindling due to human encroachment, habitat degradation and unsustainable hunting. The level of threat to the island's endemic species has made the island a priority biodiversity hotspot for conservation (Brooks *et al.* 2002). Long-term conservation and education programs that utilize Madagascar's unique 'flagship' charismatic species often represent collaborations between in-country and international conservationists. Although lemurs have been the focus of many education and conservation programs on Madagascar and are incorporated into environmental education lessons in schools near some protected areas, little has been done to promote the welfare and conservation of bat species on the island. The conservation status of Madagascar's fruit bats is of growing concern because of destruction of roost sites and the demand for bushmeat (MacKinnon *et al.* 2003).



When the Bat TAG identified Madagascar's endemic fruit bats as a priority species of concern, we turned to our AZA colleagues with expertise in this area: the AZA Madagascar Fauna Group (MFG). In collaboration with the MFG, we began a partnership for bat conservation education with Parc Ivoloina in Tamatave. By joining with this proven and established conservation program, the Bat TAG has been able to promote an often-overlooked group of animals to the forefront of conservation initiatives through in situ education programs.

### Madagascar's Fruit Bats and the Current Cause for Concern

Madagascar is home to at least thirty different species of bats, eighteen of which, including all three fruit bats, are endemic to the island (Eger & Mitchell 2003). The three megachiropteran fruit bat species found in Malagasy forests are the Madagascar flying fox (*Pteropus rufus*), the Madagascar straw-colored fruit bat (*Eidolon dupreanum*), and the Madagascar rousette (*Rousettus madagascariensis*). All three species are important pollinators and seed dispersers for the island's endemic plants (e.g. Andriafidison *et al.* 2006; Bollen & Donati 2006). *Pteropus rufus* and *E. dupreanum* are known to feed on at least fifty different plant species, and many of these endemic to Madagascar. *Eidolon dupreanum* also visits two species of IUCN endangered baobabs (*Adansonia suarezensis* and *A. grandidieri*), and probably provides pollination services to both (Andriafidison *et al.* 2006; Baum 1995).

Populations of *P. rufus* and *E. dupreanum* are diminishing due to heavy and sustained hunting for the bushmeat trade and local consumption (MacKinnon *et al.* 2003). In addition, the Madagascar flying fox is also threatened by the loss of roost sites that result from deforestation. The Madagascar flying fox has become a species of concern for the IUCN/SSC Chiroptera Specialist Group and in 2004, was moved from near threatened to vulnerable on the IUCN Red List. Conservationists cannot rely on protected areas or wildlife law to protect Malagasy fruit bats because most roosts occur outside of reserves and fruit bats are classified as game species (MacKinnon *et al.* 2003). Conservation action is urgently needed for fruit bats in Madagascar to address the anomaly of having endemic, threatened mammal species that can be legally hunted for food, sport or crop protection. We believe that initiating a local conservation education program on Madagascar now, while there are viable populations of fruit bats still left in the wild, may be the only solution to bridging the gap between legal exploitation under existing wildlife law and the need to conserve the remain-

ning populations of fruit bats. The goal is to increase the awareness of the local Malagasy people, especially in the communities living near to large, existing bat roosts, about the important ecological role bats play as key to the future survival of Madagascar's forests.

### Partnership Facilitates Bat Conservation Education

The Bat TAG initiated discussions with the Madagascar Fauna Group (MFG) and we agreed on the need for stronger educational initiatives focusing on vertebrate species other than lemurs. Through the MFG, the Bat TAG developed a relationship with Parc Ivoloïna in Tamatave, where MFG staff Andrea Katz and Charlie Welch welcomed the idea of a collaborative effort between the Bat TAG and the MFG team on bat education. Even though there were no bats on exhibit at Parc Ivoloïna, we determined that the project would consist of two elements: interpretive graphic panels for the Parc, and an educational kit and curriculum for use in Parc education programs for schools and other children's groups. We developed the following program goals and expected outcomes:

#### Goals

1. To educate public visitors and school groups to Parc Ivoloïna about the ecological significance of their endemic species of fruit bats, especially the Madagascar flying fox and the Madagascar straw-colored fruit bat as key to the future survival of Madagascar's forests.
1. To increase awareness of why populations of these species of fruit bats are declining in Madagascar and the need for their conservation.
3. To encourage visitors to conserve bats by not eating them and by preserving forest habitat.

#### Outcomes

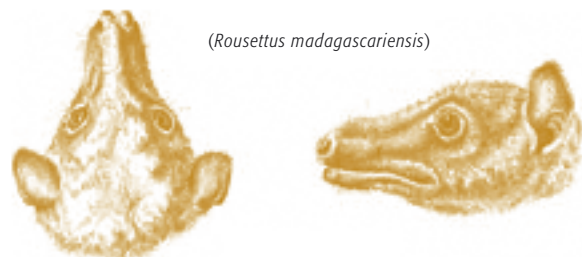
Program participants and park visitors will:

- Understand that these fruit bats are wildlife treasures unique to Madagascar
- Identify bats as key pollinators and seed dispersers of endemic plants, including some plants that are economically important
- Recognize that the key to saving Madagascar's declining forests is to conserve the bats that are necessary to the survival of plants
- Name two ways that people can help save bats: by not eating them and by protecting their forest habita

#### Learning Outcomes for Students

Through their participation in the lessons and educational activities contained in this kit, children will:

- Understand that bats are mammals with many special adaptations for survival
- Learn that there are nearly 1,000 different kinds of bats in the world that vary in size, appearance, habits and feeding strategies
- Examine people's attitudes about bats and learn that bats are not scary -bats are our friends!
- Discover how fruit bats are adapted to eat fruit, nectar and pollen, and that they are important pollinators and seed dispersers of tropical plants
- Be able to name some of the fruits we eat and other plant products we use that depend on bats
- Understand that bats play important roles in their environment and that their survival affects the whole community of wildlife
- Realize that Madagascar fruit bats are found nowhere else on Earth, and be encouraged to take pride in their unique wildlife heritage
- Learn why Madagascar fruit bats are endangered
- Discover ways that students can be involved in protecting habitat for wildlife



#### Program Development

Parc Ivoloïna has an annual attendance of 15,000 visitors per year, 85% of whom are native Malagasy; the remaining visitors are international tourists. We began the project by asking Parc Ivoloïna staff to survey a small group of young Parc visitors to assess their attitudes and knowledge about bats. From the responses made by the seven groups of children ages 12-14 years from the Lycee Francais of Tamatave, more than 50% knew nothing or very little about bats and nothing about these bats' existence in Madagascar. Most knew nothing about bats' ecological role in pollination and seed dispersal, which confirmed the Bat TAG's previous experience when working with school children on the island of Rodrigues. Following the success of the bat education kit and curriculum the Bat TAG developed for Rodrigues fruit bats, we developed a similar program for Madagascar fruit bats.

## Les chauves-souris sont des Mammifères

Les chauves-souris sont des mammifères—elles ont une fourrure douce et allaitent leurs bébés. La plupart des chauves-souris sont petites et se nourrissent d'insectes volants comme les moustiques. Les roussettes plus grandes s'alimentent la nuit dans les arbres en fruits, feuilles, fleurs et nectar.



## Les roussettes au service des arbres

Beaucoup d'arbres et d'autres plantes dépendent des roussettes. Comme la chauve-souris boit du nectar doux d'une fleur, du pollen poudreux colle à sa tête. Quand la chauve-souris s'en va, le pollen qu'elle porte à la fleur prochaine fertilise celle-ci, qui à son tour produira un fruit avec les graines à l'intérieur.

Les roussettes mangent aussi des fruits très mûrs. Elles portent souvent le fruit loin de l'arbre. Les graines entrent dans le corps de la chauve-souris seulement pour en sortir peu après. Là où une graine tombe au sol, une nouvelle plante poussera.

Les gens ont besoin des forêts pour le bois, le fruit et d'autres produits de plante. Beaucoup d'animaux ont aussi besoin des forêts pour la nourriture et l'abri. Sans les chauves-souris, beaucoup d'arbres ne pourraient pas survivre. Les forêts de Madagascar ont besoin des chauves-souris!



## Biby mampinono ny fanihy sy ramanavy

Biby mampinono ny fanihy sy ramanavy—rakotra volo malemy ny tenany sady minono ny zanany. Madinika ny ankamaroany sady mihinana bibikely manidina toy ny moka. Ny fanihy dia ngeza ary amin'ny alina izy no mitady sakafo toy ny voan-kazo, ravina, felana sy mamim-bonin-kazo.

## Miasa ho an'ny hazo ny fanihy

Hazo sy zava-maniry maro no miankina amin'ny fanihy. Raha mitsentsitra ny rano mamy anaty felana ny fanihy na ramanavy dia mipetaka amin'ny lohany ny vovo-bony. Raha mitsentsitra ny felana manaraka izy dia mifindra amin'ilay felana faharoa ny vovo-bony eo amin'ny lohany ka izany no mampiforona ny voan-kazo.

Mihinana voa masaka tsara koa ny fanihy. Entiny lavitra be ny voa. Ateliny ny vihiny ary mbola havoakany indray. Amin'ny toerana hilatsahan'iny vihy iny dia misy hazo vaovao hitsiry.

Ilain'ny olona ny ala hakany kakazo, voa na zavatra hafa. Biby maro koa no mitady hanina sy manao trano ao an'ala. Karazan-kazo maro anefa no ho ringana raha tsy misy ramanavy sy fanihy. Ilian'ny alan'i Madagasikara ny fanihy sy ramanavy.

Photographs of Madagascar  
by David J. Green  
July 2006  
www.madagascar.com

Image of David Green  
July 2006



The kit contained a fruit bat costume, a variety of bat face masks (colored, laminated, and with elastic string so children can try them on), and games. One of these is a 'board game' format, with players advancing through various events a fruit bat's daily life. The game is drawn on a plastic shower curtain, with laminated playing pieces. These were added to a kit also containing children's books about bats, plastic replicas of bat diet items, laminated bat photos, and a 'pollination simulator' consisting of cream-colored, large silk flowers, talcum powder and plush bat puppets. The lesson plans from the Rodrigues curriculum were revised and adapted for Madagascar and a new curriculum packet specific to Madagascar's endemic fruit bats was prepared. The written material was translated into French and will be translated into Malagasy by Parc Ivoloïna staff.

### Implementing Bat Conservation Education in Madagascar

As the bat education kit and curriculum were being created, Richard Jenkins of the University of Aberdeen requested that a second duplicate kit be developed. As director of Madagasikara Voakajy, the new Malagasy NGO that specializes in bat conservation and is active in sites across the island, Richard felt that the kit could be valuable for a project near Moramanga, in eastern Madagascar. This area still holds significant numbers of Madagascar flying foxes but their roost sites are unprotected and are under severe threat from human activities (Jenkins *et al.* in press). Building on the momentum from a project in 17 rural primary schools that increased the awareness about fruit bats to children and teachers, Richard and his partners in Moramanga (Arongampanihy, Culture, Communication and Environment - ACCE) visited Parc Ivoloïna in November 2004 with Co-chair of the IUCN Chiroptera Specialist Group Professor Paul Racey to discuss a new bat education display for the park.

During the visit it became clear that, like the majority of Madagascar's conservation professionals, the MFG staff were lacking background and context about fruit bat ecology and conservation, having for so long educated visitors about general environmental education issues (O'Connor *et al.* 2005). It was also evident that the Madagasikara Voakajy and ACCE teams lacked significant teaching experience and could learn a lot from the MFG education team. A workshop was therefore planned for an exchange of information, ideas and experiences and to discuss ways of using the bat education kit in Madagascar and of integrating the conservation message into formal teaching in primary schools.



**A la rencontre des roussettes de Madagascar**

Ces chauves-souris vivent seulement au Madagascar et nulle part d'autre sur la terre!

**La roussette malgache**  
Les roussettes malgache, les plus petites roussettes de Madagascar, sont trouvées sur la côte de l'est et dans la moitié septentrionale de l'île. Comme elles se nourrissent de fleurs, les roussettes pollinisent les arbres de baobab.

**La roussette malgache couleur paille**  
Ces roussettes sont trouvées dans le plateau central de Madagascar, où elles se perchent dans les parois de rocher. Les roussettes couleur paille se nourrissent de 35 genres de plantes, dont beaucoup se trouvent seulement au Madagascar. La chasse abusive de ces chauves-souris comme nourriture a causé la désertion de beaucoup de perchoirs.

**Le renard volant malgache**  
Trouvés principalement dans les secteurs côtiers de basses terres, les renards volants malgaches se rassemblent en grands groupes comportant de plusieurs centaines à plusieurs milliers d'individus. Ils mangent 38 genres de plantes, y compris l'arbre de tamarin, la papaye et beaucoup de plantes indigènes. Les roussettes de Madagascar ont besoin d'habiter des grandes étendues de bois. Les arbres mûrs de la forêt leur offrent des secteurs de perchoir et la protection des cyclones. Le déboisement au Madagascar est la principale raison pour laquelle ces roussettes sont menacées. Dans quelques secteurs, les renards volants malgaches sont aussi chassés avec les fusils pour la nourriture.

**Préservez nos forêts--  
Protégeons nos chauves-souris!**

*Voici comment vous pouvez aider à préserver les roussettes de Madagascar*

- ☀ Protéger les forêts où se nourrissent et s'abritent les chauves-souris
- ☀ Prière de ne pas manger les chauves-souris
- ☀ Parler à d'autres gens des chauves-souris

**Eo am-pahitana ny fanihin'i Madagasikara**

Eto Madagasikara ihany no iveloman'ireo fanihy ireo!

**Ny fanihy gasy**  
Izy no fanihy kely indrindra eto Madagasikara; aty amin'ny morontsiraka atsinanana sy antsanakany ny zava-mainty ny nosy no ahitana azy. Satria vonim-kazo no fihinany, manambatra lahim-bony sy vavim-bonin'ny baobab izy.

**Ny fanihy hasaka**  
Mihantona amin-bato any afovoan-tany no ahitana azy. Zava-mainty 35 karazana saika tsy hita afa tsy eto Madagasikara no fihinany. Noho ny fihazana tafahoatra azy ho sakafo dia mandao ny toeram-ponenany ny fanihy hasaka.

**Ny fanihy mena**  
Aty morontsiraka ny fonenany ka mivondrona an-jatony na an-drivony maro izy. Mihinana zava-mainty 38 karazana izy toy ny voamadiro, voapaza sy zava-mainty zava-tany maro. Betsaka ny ala vao ahafahan'ny fanihy malagasy mivelona. Mianto azy ireo ny vonim-kazo masaka any an'ala. Mandringana azy kosa ny fanimbana ala indrindra indrindra. Eo kosa ny fihazana ireo fanihy mena amin'ny basy any amin'ny faritra sasany mba hohanana.

**Kajio ny alantsika--  
Arovy ny fanihy sy ramanavintsika!**

*Izany no ahafahanao manampy ny fihazana ireo fanihin'i Madagasikara*

- ☀ Arovy ny ala izay isakafanana sady onanan'ny fanihy sy ramanavy
- ☀ Aza hanina re ny fanihy sy ramanavy
- ☀ Tantarao aminolon-kafa ny momba ireo fanihy sy ramanavy

The two graphic panels were installed at Parc Ivoloïna, where follow-up work will include having park staff survey visitors to gauge their understanding of the panels' messages about importance of Madagascar's fruit bats, why their populations are diminishing, and what people can do to protect them.

### Partnership Ensures Program Sustainability

Of the two bat education kits in Madagascar, the MFG is using one to educate the visitors to Parc Ivoloïna and will also be used in schools near the Betampona Reserve. The kit has already been piloted in July 2005

## Bat Conservation Education Workshop

In April 2005 thirty six people attended a three-day workshop in Moramanga. In addition to representatives from Madagasikara Voakajy, ACCE and MFG, other participants included ANGAP (National Parks Service), CISCO (Education Authority) and DIREF (Ministry of the Environment, Water & Forests). Three members of Action Comoros, an NGO from Comoros Islands dedicated to flying fox conservation also attended.

### Day one

The morning consisted of presentations by Madagasikara Voakajy and ACCE on the diversity, ecology and conservation of Malagasy fruit bats. The participants divided into groups in the afternoon to discuss the particular sections of the education kit (i.e. bat biology, bat ecology and bat conservation) and the application of the kits to primary school teaching.

### Day two

Children from a local school fruit bat club (Club Fanihy) joined the workshop and experimented with the games and demonstrations in the bat education kit. This was followed-up by a plenary session to bring together ideas on the bat education kit and to develop a strategy for integrating bat conservation into primary school teaching. The main recommendations from the workshop were to:

1. Implement a pilot project based on the format below in eight primary schools to test the suitability of bat conservation information for uptake across Madagascar
2. Produce a guide to 'Bats and their Conservation' for educators in Madagascar
3. Establish a network of conservation groups in Madagascar and other islands in western Indian Ocean to share experience and ideas
4. Educate more conservation professionals in Madagascar about bats
5. Mass produce the graphic panels as small color posters for schools

### Day three

On the last day of the workshop the participants visited a Madagascar flying fox roost that ACCE and Madagasikara Voakajy are actively trying to protect, and discussed practical ways of conserving the bats and their roosting habitats. The field visit gave MFG educators a valuable opportunity to observe the behavior of Madagascar flying foxes. Staff from the Peregrine Fund in Madagascar shared their experiences about community management of important conservation sites that lie outside of the protected area network, and this approach was generally agreed to have significant potential for fruit bat roosts.

(with great success) with a group of students from villages surrounding the zoo, who spent an entire day learning about the threats to bats in the local area. This kit is therefore mainly used in a single site but reaches many children through the activities of the MFG which is based permanently in Madagascar.

The other bat kit will be taken into schools situated near to roosts, and will impact a large number of children from different sites. The second kit is therefore being used by two national organizations and has already

been used in schools in the west, east and south-east of Madagascar. For example, Madagasikara Voakajy used the kit in December 2005 in the Sainte Luce forest, located in the southeastern tip of the island, where the remaining three flying fox roosts are threatened by hunting and habitat loss (Bollen & Donati 2006). The kit was also used in 2005 at three schools near to Maromiza Forest in eastern Madagascar following requests from workshop attendees for us to help conserve a Madagascar roussette roost. And most recently, in May 2006, it was taken to Antsalova in western Madagascar where it



was used to give conservation lessons to primary school children who live near the Parc National Tsingy de Bemaraha.

Eight schools from the Moramanga area were selected for a pilot project, and teachers from those schools attended a bat education workshop in April 2006. Bat conservation booklets prepared by Madagasikara Voakajy are now being tested in these schools and further schools will be added to the program in 2007. Evaluation and assessments will be undertaken by the 'Bureau Programme Education Environnementale' (Ministry of National Education and Scientific Research) leading eventually to the bat conservation lessons being incorporated into the national curriculum.

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## Conclusion

Development of conservation education programs in the field presents several challenges. Although technology has made communication easier, translation of programs into local languages, transportation and delivery of materials, and collaboration among numerous organizations and individuals adds complexity and time. In addition, measuring outcomes from these programs also means that conservation education efforts are long-term projects. Forging relationships among groups with similar interests has taken us a long way towards the completion of our education initiatives in Madagascar. Further collaborations with the Madagascar Fauna Group, Parc Ivoloina, and Madagasikara Voakajy will enable the Bat TAG to continue our conservation education role in this region as well as to utilize the successes of these programs as a template for future projects.

## Acknowledgements

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