## Unusual strategy for a part-time leaf-eater



Among the mammals, eating leaves is something of a specialised task. Those that undertake it have large areas of the gut at either the fore or hind end where the slow breakdown of fibrous compounds such as cellulose can take place. Generally speaking, small mammals are unable to be strict leaf-eaters (see Ecos 51 for the reasons behind this).

So what was the meaning of the small green pellets on the ground beneath a tree where flying foxes had been feeding at night? Dr Brian Lowry of CSIRO's Division of Tropical Animal Production in Townsville was curious enough to investigate. Could it be that flying foxes, which normally only eat fruit or flowers, were in fact eating leaves? And if so, how were

The tips of the branches, defoliated by the bats' leaf-eating.

they able to extract useful nutrients from them?

Watching the tree at night, he found that a black fruit bat *Pteropus alecto* did indeed spit out the green pellets while feeding on the leaves of a leguminous tree (*Albizia lebbek*).

In leaf- and grass-eaters, all the food is passed slowly through the gut, with variations in the time required for fibre digestion, and suitable chambers provided for it. However, the bat has only one stomach and the rate of passage of food through its system is very quick — of the order of half an hour or less.



So was there any nutritional point in the bats eating leaves?

Dr Lowry analysed the pellets, and the leaves of the tree, for fibre and protein. He found that the concentration of fibre in the pellets was



The leguminous tree (Albizia lebbek) where the bats were roosting.

620 g per kg, while that in the leaves was only 450 g per kg. The protein, however, had at a higher concentration in the leaves (198 g per kg) than in the pellets (132 g per kg).

Evidently, the bats are absorbing some of the leaf protein, and concentrating the remaining unwanted fibre, which their system would be unable to digest. This makes sense for an animal whose fruit diet, although rich in carbohydrates, contains only limited protein.

What the bats must be doing is separating the soluble protein part of the leaves from the insoluble fibre. This leaf fractionation is a neat strategy

Fibrous pellets spat out by the bats and found under the *Albizia* tree.



that enables them to extract some of the benefit of the leaves without having to deal with the large quantities of fibre that usually ensure that leaf-eating remains a specialised way of feeding.

The bats chew the leaves, swallow the soluble component, and small particles, and expel the remaining fibrous mass in the form of the pellets. Although this behaviour has occasionally been seen before, nobody has ever proved that the animals were gaining nutritionally.

Of course, it is unlikely that the bats could exist exclusively on leaves, and certainly many leaves would not be suitable for them. *Albizia lebbek* trees, however, contain protein with an unusually high digestibility.

Many tropical tree species have tough leaves that make extraction difficult, and/or contain compounds that either render protein indigestible or are poisonous. This perhaps explains why we have not often observed leaf-eating in flying foxes; if the 'right' tree is available, however, it must be a useful means of supplementing protein.

Dr Lowry suspects that this feeding strategy is not confined to Australian flying foxes. He has seen similar leaf-fibre pellets in Java under a tree where flying foxes were roosting. And could it be that this newly discovered herbivore strategy also occurs among other mammals? If it does, Dr Lowry believes it would probably be among the primates, the order to which we belong.

Many tree-dwelling monkeys have a gut that is moderately well-adapted to fibre fermentation — as indeed it now appears that the human system may be (see *Ecos* 51) — so these animals would not need to spit out the fibrous component. However, those primates that are mainly fruit-eaters might benefit, and the large cheek pouches that many of them have would be useful for fractionating the leaves.

Although it is apparently not yet known scientifically, Dr Lowry is predicting that we will soon find this nutritional strategy in some primates. Time will tell.

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Green-leaf fractionation by fruit bats; is this feeding behaviour a unique nutritional strategy for herbivores? J.B. Lowry. Australian Wildlife Research, 1989, **16**(3) (in press).