

Do bats eat mozzies or moths? The clue is in the poo

October 22 2013, by Cameron Webb



This diet's driving me batshit. Credit: dseviaoria

Bats fascinate me. So, naturally, does their diet. [Recent research](#) showed that bats made "feeding buzzes" over saltmarsh habitats. These habitats are full of mosquitoes and this specific buzz is made only when bats are hunting. Radio-tracked bats also seem to [follow mosquitoes between habitats](#). The assumption then was that bats ate mosquitoes. Sadly, that does not say much.

How many [mosquitoes](#) are eaten by bats? How many [bat species](#) were eating mosquitoes? How important are mosquitoes, compared to other insects, such as moths, to the diet of bats? We set out to find the answers.

There are a few ways you can find out what bats are eating. A simple approach is to study their fecal material. That involves looking at bat poo under the microscope for bits of insect and then identifying it. Although this technique has been used successfully, it only took us 15 minutes of looking through bat poo to realise this wasn't going to cut it. We could clearly identify pieces of insect but what were they? We never found a piece of "entomological material" in the samples that was definitively from a mosquito.

Since we know there was insect material in the feces, perhaps we could use molecular methods to identify them. Instead of looking for bits and pieces of chewed up mosquito bits, why not look for their DNA?

Fecal samples were taken from five eastern Australian bat species; *Vespadelus vulturnus* (little forest bat), *Vespadelus pumilus* (eastern forest bat), *Miniopterus australis* (little bent-wing bat), *Nyctophilus gouldi* (Gould's long-eared bat) and *Chalinolobus gouldii* (Gould's wattled bat). These bats are relatively common in coastal regions of New South Wales and range in weight from 4-14 grams.



Leroy Gonsalves removing a little forest bat from the harp trap. All set to collect some poo. Credit: Doug Beckers

Bats were collected using harp traps set in forest habitats near wetlands. Trapped bats were then transferred to small bags, where they were kept for at least an hour before being released. Fecal pellets were collected from the bottom of the bag.

Five samples from each bat were tested for the presence of mosquito and moth DNA using molecular techniques. Our method could identify insect remains even if they made up only 5% of the fecal sample.

What's the buzz?

Across the five bat species, fecal samples were collected from 52 bats. From the fecal samples, a total of 40 prey species were identified. Moths

were the most frequently detected prey, present in the feces of 49 of the 52 bats (about 94%).

Interestingly, mosquitoes were only detected in the feces of two bat species. Of those bats, mosquitoes were collected from two of ten *Vespadelus pumilus* individuals and 11 of 20 *Vespadelus vulturnus* individuals. All of them had eaten moths, too.

So what do the results, published in [PLOS ONE](#), mean? First, they highlight the dangers of generalisation when it comes to bat biology. We have shown there is species-specific relationship between bats and their preferred meal.

Second, this relationship is probably driven by the size of the bat. Small bat species are more likely to feed on mosquitoes. This makes sense. Other studies have shown that when it comes to eating insects, larger predators tend to eat larger prey, rather than a large number of smaller prey.

Third, for conservationists, the results show that if smaller bat species are endangered, substantial reductions in the local mosquito populations might not be a good idea. Local authorities must balance the need to reduce mosquito-borne disease risk but should be mindful of this potential when designing large mosquito control programs. In case of large bat species, perhaps they should be doing more to encourage moth populations.

Finally, techniques similar to ours have now been used widely. Some used it to determine if bats are eating [agricultural insect pests](#). Others used it to track bats and their response to [seasonal fluctuations of these pest insects](#). And some wanted to know what [snakes eat](#). (Spoiler: it's [bats](#)).

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