

Study examines sex-specific responses of Neotropical bats to habitat fragmentation

by Mike Gaworecki on 2 August 2017

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- *Research published in the journal *Biotropica* this month looked at the different responses to the effects of fragmentation exhibited by male and female individuals of Seba's Short-tailed Bat (*Carollia perspicillata*) and the Dwarf Little Fruit Bat (*Rhinophylla pumilio*), both fruit-eating bats native to the Neotropics.*
- *Researchers captured more than 2,000 bats of the target species in eight forest fragments of various sizes and nine control sites at the Biological Dynamics of Forest Fragments Project, a*

research forest about 80 kilometers north of Manaus in the Brazilian Amazon.

- *The authors of the study write that their results align with those of previous research in temperate areas, where male and female bats have been found to differ in their responses to habitat degradation at the local and landscape level.*

In order to preserve a species from the impacts of human activities that degrade or fragment its habitat, it's necessary to understand how the species responds to changes to the landscape it calls home. But while scientists have long known that males and females of some species use their habitat in different ways, the various responses to habitat destruction that are sex-specific are less well understood.

Research published in the journal *Biotropica* (<http://onlinelibrary.wiley.com/doi/10.1111/btp.12474/full>) this month looked at the different responses to the effects of fragmentation exhibited by male and female individuals of Seba's Short-tailed Bat (*Carollia perspicillata*) and the Dwarf Little Fruit Bat (*Rhinophylla pumilio*), both fruit-eating bats native to the Neotropics.

Bats provide a number of vital ecosystem services in the tropics, from seed dispersal and pollination to keeping populations of invertebrates in check. If the gender composition of a particular bat population becomes too heavily biased towards one sex, that can have obvious implications for the species' chances of survival. But, according to Ricardo Rocha, "up-to-now no study had investigated sex-specific responses, despite their overwhelming importance for the dynamics and long-term persistence of natural communities."

Rocha led the *Biotropica* study together with his colleague at the University of Lisbon's Centre for Ecology, Evolution and Environmental Changes, Diogo Ferreira. Rocha and Ferreira expected to find divergent response patterns to habitat fragmentation in male and female bats because of their differing energetic needs. "Females of the two species that we studied have their period of highest reproductive activity in the dry season," Ferreira said in a statement. "When females are pregnant or lactating, their responses to landscape features will be different because females will be more dependent on fruit availability or will not be able to travel as far as males to forage."

For the study, the researchers captured more than 2,000 bats of the target species in eight forest fragments of various sizes and nine control sites at the Biological Dynamics of Forest Fragments Project, a research forest about 80 kilometers north of Manaus in the Brazilian Amazon.

They sampled both male and female bats in the dry and wet seasons in a variety of habitats, including continuous primary forest, fragment interiors, forest edges, and secondary forest.

The authors of the study write that their results align with those of previous research in temperate areas, where male and female bats have been found to differ in their responses to habitat degradation at the local and landscape level.



Rhinophylla pumilio. Photo © Adrià López-Baucells.

Capture rates of *C. perspicillata*, for instance, were higher for females than males during the dry season at edges and secondary forest matrix sites, as well as in continuous forest and fragment interiors, albeit to a lesser extent. The researchers believe this is because the dry season is the peak reproductive period for the species, and the females are therefore seeking out the most resource-rich areas to make foraging for a meal easier — their favorite food, it turns out, happens to be fruit from tree species that flourish in newly created forest gaps, which is why females were so much more abundant than males on the edges of forest fragments. The capture rate of *R. pumilio* females was also higher during the dry season.

During the wet season, both males and females demonstrated strong responses to local habitat features, which the authors suggest is due to the fact that neither sex has to travel long distances to find food during the wet season, making localized habitat disturbance a more critical issue.

"Our results suggest that, at least for some species, male and female bats respond to fragmentation in different ways and that responses to local- and landscape-scale attributes are sex- and season-specific," they write in the study.

Christoph Meyer, a lecturer in Global Ecology and Conservation at the UK's University of Salford and senior author of the *Biotropica* study, adds: "Our study suggests yet another level of complexity in terms of how tropical bats respond to landscape-scale changes in their environment."

Research has consistently shown habitat fragmentation to be one of the chief threats to wildlife. A 2016 study (<https://www.nature.com/nature/journal/v535/n7610/abs/nature18326.html>), for instance, found that road building, selective logging, wildfires, and other man-made disturbances in the Brazilian state of Pará have caused as much biodiversity loss as clearing 92,000 to 139,000 square kilometers (<https://news.mongabay.com/2016/06/forest-degradation-in-brazil-can-have-just-as-drastic-an-impact-on-biodiversity-as-deforestation/>) (about 35,500 to 53,700 square miles) of pristine forest — which is more than the total area of deforestation in the Brazilian Amazon between 2006 and 2015. (If you find it easier to digest this kind of data visually, don't miss the "data visualization project" focused on this study's findings (<https://news.mongabay.com/wildtech/2017/07/visualizing-the-impacts-of-human-disturbance-on-tropical-forest-biodiversity/>).

With the world's human population increasing and per capita consumption in the developing world rising, the rate of tropical forest fragmentation is expected to accelerate in the coming decades, as well. Rocha noted that this makes a deeper understanding of species' responses to fragmentation all the more critical.

"In this context, it is important to know if males and females respond differently, especially when you consider that modifications in population structure, i.e. sex ratio, can act to diminish or magnify the pervasive impacts of forest loss and habitat fragmentation," he said.

Anthropogenic disturbance in tropical forests can double biodiversity loss from deforestation.

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(<https://www.nature.com/nature/journal/v535/n7610/abs/nature18326.html>)

- Rocha, R., Ferreira, D. F., López-Baucells, A., Farneda, F. Z., Carreiras, J., Palmeirim, J. M., & Meyer, C. F. (2017). Does sex matter? Gender-specific responses to forest fragmentation in Neotropical bats. *Biotropica*. doi:10.1111/btp.12474

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Carollia perspicillata. Photo © Oriol Massana & Adrià López.

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