Project Update: September 2014

Project summary

Artificial roosts attract fruit-eating bats into deforested areas, representing a promising tool for accelerating seed input and forest regeneration. However, the method's applicability is not developed for large-scale use yet, and information on seedling establishment around roosts is lacking. Additionally, the beneficial ecosystem function of bats is still widely unknown and they are regarded as a pest. This hinders the use of bat roosts for nature conservation. We aim to identify the utility of bat roosts for reforestation and develop tools for informing about bats as agents of seed dispersal, thereby communicating an inexpensive technique for enhancing tropical forest recovery.

Introduction

Bats are important seed dispersers in the tropics. Their fruit consumption increases dispersal distance from parent plants, seed germination, and seed survival. They disperse keystone species, and help maintain forest diversity because of their diverse diet. In addition, bats aid in forest regeneration because many of their food plants are pioneer species, and bats deposit their seeds in highly disturbed areas where other frugivores rarely venture. Therefore, a healthy frugivore bat community is important for successful forest regeneration and the maintenance of diverse plant communities.

However, bats lose essential roost trees by deforestation. Also, bats are often regarded as pests and their roosts are destroyed, which affects bat distribution with concomitant effects on seed dispersal. Artificial bat roosts have been suggested as an effective tool for facilitating bat colonisation of deforested areas, thus supporting seed dispersal and potentially accelerating reforestation. However, while the significance of artificial roosts in attracting bats is recognised, their effect on forest succession has not been tested. Also, the utility of roosts for reforestation may be hampered due to superstition towards bats and the pivotal role of bats as agents of forest recovery is not appreciated by conservation and government agencies in their regeneration programmes.

The main objective of our project is to test, develop and propagate a novel method for increasing seed dispersal in degraded tropical habitats. In detail, we aim to validate artificial bat roosts as a method for augmenting seed dispersal and seedling establishment in deforested areas, improve the conception of bats as important agents of ecosystem services, and train local people and organisations to apply bat roosts and act as multipliers and contact points for bat issues. The proposed method could not only be employed as a singular means for boosting vegetation succession, but may also serve as an auxiliary technique in nature restoration projects, especially in such situations where restoration techniques that need constant maintenance are precluded or the floral connectivity of fragmented habitats shall be improved.

The main outcomes we expect from our project are five. First, we will install six bat roosts, thereby increasing seed disperser abundance and seed input. Second, we seek to improve the colonisation speed of artificial roosts by using acoustic lures. Third, we want to measure seedling establishment using seeds accumulated in artificial bat roosts. Fourth, we want to promote artificial roosts as a method for forest recovery projects among five nature

conservation organisations. Last, we will inform three communities and schools about the method to foster a greater appreciation of reforestation projects as well as bats as providers of ecosystem services.

Figure 1. Photo of one of the 8 artificial bat roosts constructed.

Preliminary results

Goal 1: Install six bat roosts.

We have constructed six roosts with the funds acquired through Rufford, and two more with funds from other sources (Figure 1). The eight roosts were more complicated to construct and install than originally planned, and more expensive, which caused the project's timeline to be shifted; this has prevented us from fully accomplishing the other objectives. In addition, while other studies by us demonstrate that artificial roosts can be colonised successfully in less than a month, we have not observed that in our current work. We believe this slow colonisation is caused by boxes being located in pastures where fruit-eating bats are probably not too abundant.

Figure 2. Photo showing traces of fruits consumed by bats using one of the bat boxes.

So far we have observed only one roost being used by fruit-eating bats, with substantial accumulation of guano on its base (Figure 2). Because we have not observed bats in the roost during the day, we suspect bats are using this box only during the night as a feeding roost. The accumulation of long stalks, as shown in Figure 2, suggests that the diet of the bats using this box is mainly composed of fruits of the genus *Piper*, which is an important pioneer plant species in the Neotropics. *Piper* fruits are mainly consumed by bats of the genus *Carollia*, which are abundant in many types of forests in the Neotropics, and are considered critical for forest regeneration.

While only one roost is being used by fruit-eating bats, we have also observed an insect-eating bat using one of our boxes (Figure 3). This roost was placed in an oil-palm plantation, and was quickly colonised in less than 1 month after being constructed. We suspect the species using this roost is *Saccopteryx bilineata*, based on coloration and roosting behavior. This species is relatively common in lowlands of Costa Rica.

Figure 3. Photo showing an insect-eating bat roosting on the inner side of a bat box.

Goal 2: Improve the colonisation speed of artificial roosts by using acoustic lures
For acoustic trials, we have used social calls of fruit-eating bats of the genus *Carollia* that were facilitated to us by another colleague. These calls, which are used by males to attract females, do not seem to be working, or have not been perceived by bats probably as they are not abundant in pasturelands. We are looking for calls of other fruit-eating species and will broadcast them together to increase our chances that one of the recorded species will hear them.

Goal 3: determine seedling establishment
Only one of the constructed bat boxes has been used by bats; hence, seed input is not sufficient yet to begin trials on plant establishment.

Goal 4: Promote artificial roosts as a method for forest recovery projects among five nature conservation organisations
Osa Conservation, a conservation organisation that we have been working closely with, has been pivotal in helping us construct and install our bat boxes in their properties; this interaction with a conservation leader in the area has helped us promote the use of artificial bat roosts as tools to facilitate forest regeneration. However, as the boxes were constructed later than expected, and bats have been slow at colonising roosts, we do not yet have results to present to other local organizations on the effectiveness of the method.

Goal 5: Inform three communities and schools about the method, bat ecology and forest recovery
Local schools and communities will be involved in the project once the bat boxes have been successfully colonized by bats.

Next steps
Our most important next step is to continue monitoring roosts until sufficient bats have colonised them. Once this occurs, we can continue our other goals to measure seedling establishment and perform the intended outreach activities with other local NGOs, schoolchildren, and communities. After these goals have been achieved, we intend to promote this method, if successful, to other organisations in the country.