

PROJECT REPORT: International Wildlife Research Week

Bat's preferred landscapes

The activity of bats in different environments



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Abstract

Startled by the bizarre and exciting feeding activities of chiropterans at night, the team has chosen to study this topic more thoroughly and in depth. Bats often rely on interconnected habitat elements, with specific requirements for each species. Depending on the species, hunting grounds may vary from open country side, settlements to forests. We expected that most of the bat activities would be found in urban and deep forest. We therefore chose 5 possible habitats in the community of Tschier, where the experiment took place. Here we chose particular points, twelve at number. Acoustic survey with bat detectors was carried out during the night. There we measured the insect abundance during daytime and nighttime. Our results show that between the woodland and the urban environment, the more successful was the latter, with a higher activity of bats.

1. Introduction

Imagine a creature that has been the subject of legends for centuries, whose name and image invoke demonic apparitions and corruption of everything saint. What would be a reason to go and search for it instead of running away from it? Bats are one of the most successful mammalian species that ever roamed the face of this earth. Their species variety is absolutely staggering, with over 1,200 species found almost worldwide, in nearly every habitat.

Bats rely on interconnected habitat elements with specific requirements of each species. Depending on the species, hunting grounds may vary from open country side, settlements to forests. There are differences in seasonal and daily requirements for a bat to thrive, such as, accessibility of hunting grounds and fragmentation of the landscape through man-made structures. There are limits to what a good hunting ground would be. For example short distances from roosting places to feeding habitats and of course insect density may positively influence the bat activity.

So, ultimately, the big hypothesis that has been set was that bat activity would be the highest in urban environments, due to a variety of roosting places, and in the forest because of the absence of light and abundance of food.

2. Materials & Methods

A work of such proportions as the monitoring of bat activity in the specific environments in the community of Tschier, Canton of Graubunden, Switzerland (Figure 1) is in absolute dire need of particular attention and specificity regarding how one might carry this project out because little is known about chiropterans there.

2.1 Literature reviews

Before having started the project, it has been made sure that all useful data about species, landscapes, habits was gathered in advance, in such a way that it would aid the later measurements, discussions and comparisons (Dietz and Kiefer, 2016). Highly providing were also internet searches on the area and on the studied bats species, activities and all types of factors with influential effects (Barlow, 1999). Liaising with an expert on bats in the area to insure validity of the project was also done.

2.2 Project planning

After thorough study of already present materials with respect to the topic being discussed, it has proven to be absolutely mandatory to organize the knowledge into an adjuvant plan regarding the project. What has been undertaken was arranged carefully and clearly, to ensure close and easy following of the process. The crucial points are:

- Choice of habitat points depending on the effects of habitat types on bats
- Survey with the help of specialized acoustic equipment
- Measurements of insect abundance

2.2.1 Choice of the locations

We chose 5 different habitats, such as open forest, dense forest, open field, water bodies, citadine environment, in an area of approximately 2 km² in Tschieriv surrounding the eponymous urban settlement. We then chose twelve location within those habitats (Table 1, Figure 1).

Location no.	Habitat	Location no.	Habitat
1	water bodies	7	village
2	open field	8	open field
3	water bodies	9	open forest
4	dense forest	10	dense forest
5	open forest	11	village
6	village	12	water bodies

Table 1. The numbering of the locations within the chosen habitats. Note the coloration of the habitats



Figure 1. Map of the studied locations. The numbers correspond to table 1.



2.2.2 Acoustic survey

The vast majority of bat species in Tschier have their emergence at dusk, which was the chosen point for the beginning of the survey. The team split up in two and covered area in a systematic way (6 points each), following these principles:

Making use of special technical devices that measures high frequencies (MINI-3 bat detector, Elekon batscanner, Pettersson ultrasound detector), each team spent 15 minutes of constant sound registration at each location. They wrote down bat activity measured in calls. Moreover, descriptions were made with respect to weather conditions and insect numbers as clue donors for chiropteran activity.

2.2.3 Insect measurement

Insect abundance was measured both during the day and during the nighttime using the following techniques:

- daytime: A white bed sheet was laid upon the ground in each habitat location. Then the number of insects that flew or crawled over it was counted for 1 minute. This was repeated 3 times for each location.
- nighttime: A flashlight was lit and pointed firstly downwards and then upwards, each for 1 minute. Insects flying or crawling through it were counted

Survey kept on going until a full 6 point route has been sequentially completed by both teams, or until weather conditions such as heavy rainfall, fog or mist decreased bat activity.

3. Results

Data was collected on June 27th and 26th between 21:30 and 02:00. Bats showed extremely low activity in the closed forests, open forests, and open fields (Figure 2 and 3). Most of the calls were recorded in locations near water, and inside the village. In the second night, we recorded less calls at all locations because of the weather was cold and a bit foggy. However, the distribution of the calls was almost the same.

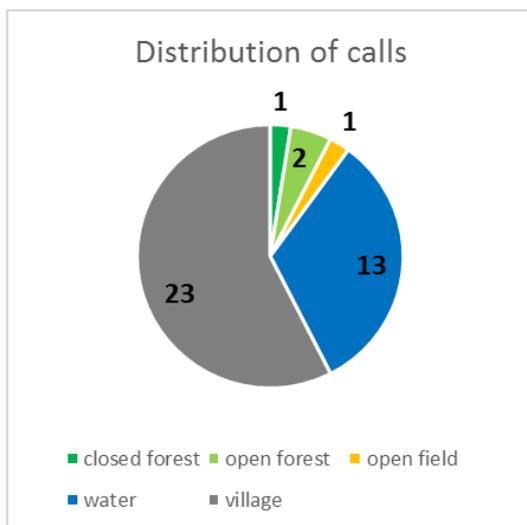


Figure 2. Average of calls counted within habitats (night 1)

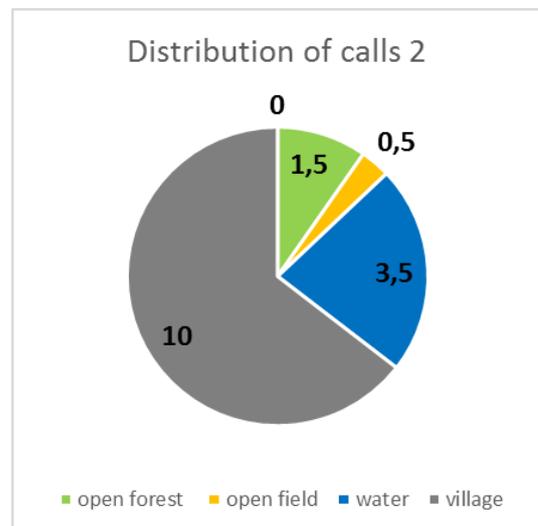


Figure 3. Average of calls counted within habitats (night 2)



The distribution of insects during the night and daytime shows slight differences (Fig. 4 and 5). Insects tended to be evenly distributed among the different habitats during daytime (Fig. 4). However, there was a slight majority of insects counted in the open forest area (approx. 23.4%). During nighttime most of the insects tended to aggregate in areas in close proximity to water (Fig. 5)

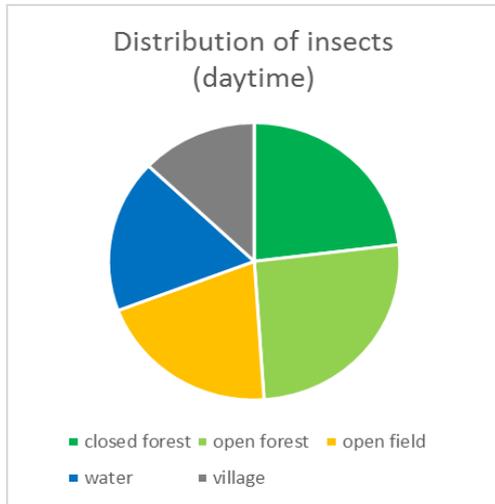


Figure 4. Abundance of insects during daytime

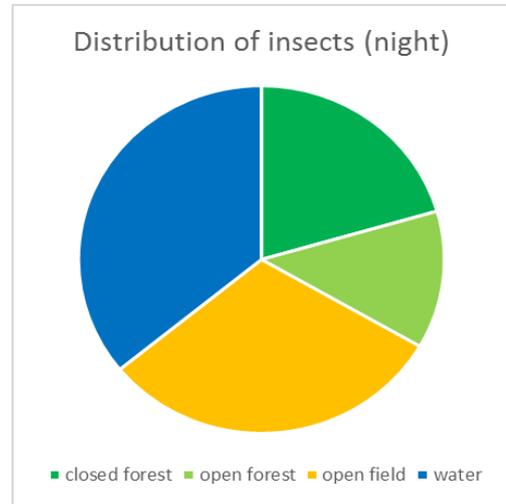


Figure 5. Abundance of insects during nighttime

4. Discussion

After having surveyed bat activity in 5 habitats and having set up a series of explicative results, the team could not help but be concerned with some penetrating questions, such as why so? How come? Based on what? Could our results be influenced by the fact that we chose 3 locations for the urban and the aquatic habitats, while the others only had 2? The first thing that comes to mind while thinking about bats and civilized areas would rather be epithetical than purely scientific, meaning that chiropterans are highly active in urban environments due to diverse roosting possibilities with the vast city of Tschieriv.

Particularly disappointing were the dense forests and the open field. Perhaps the forest environment was not “good” enough, for bats require a specific type of woodland, containing most or all natural development phases (initial, growth, peak, and decay phases). The constellations formed by the mosaic-like arrangement of such formations offer a wide variety of roosting options but more importantly feeding grounds. The trees in the forests of Tschieriv did not present all of these phases, mostly missing a stage of decay. As seen during daytime observations, the trees do not poses many cavities, lightning holes, woodpecker marks or adjuvant features for bats to thrive in.

A relatively dense activity of bats was noted near water bodies, although not as much as expected. We expected that water bodies may be drinking spots for the bats, and that they also serve as efficient food provider in form of mayflies, caddies flies or even non biting midgets. Indeed, apart from location 1 (stream), location 3 (pond) and 12 (swamp) have proven themselves to be true gardens of Eden for every kind of chiropterans, with almost permanent activity the whole night round. Albeit of our hopes in finding humongous insect activity over these waters, our expectations were not met. The incorporation of some additional important factors such as the velocity of the water might have clarified our results.

The counting of insects during daytime by using the white towel technique was not precise enough, as only the low flying insects have been registered. The measurement of insect density in urban areas was especially cumbersome as most of them were attracted to street lights, rather than the experimental methods. Easily eyed during daytime and indirectly observed at nighttime was the effectiveness of manmade gardens and green spaces in general. Arable spots, flower beds, and gardens that have not yet been sprayed with insecticide can offer a wide range of species bats can prey upon. There are plants which bloom at night or particularly well suited for nocturnal insect life are highly beneficial for bats. Hedges teem with arthropods, while vertical surfaces of walls are an open buffet based on spiders or other crawlies (personal observation). Moreover, the flashlight technique used at night wasn't much more useful either.

Having the freedom of choosing a different approach the addition of thermal cameras to visually monitor the flying and hunting bats could be a tremendous new method. Also, using a specialized lighting device to attract the insects in the evaluated habitats would prove itself to be highly advantageous, especially in urban environments where they would shun the street lights.

5. Acknowledgements

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