ResearchGate

See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/306098306

Swarm and switch: on the trail of the hibernating common pipistrelle.

Article · August 2016

CITATIONS
8

READS
5,300

5 authors, including:

Erik Korsten
Dutch Mammal Society
11 PUBLICATIONS **14** CITATIONS
SEE PROFILE

Eric Jansen
Vliegend goed
29 PUBLICATIONS **184** CITATIONS
SEE PROFILE

Herman Limpens
Dutch Mammal Society
131 PUBLICATIONS **1,102** CITATIONS
SEE PROFILE

Martijn Boonman
Bureau Waardenburg bv
16 PUBLICATIONS **320** CITATIONS
SEE PROFILE

All content following this page was uploaded by Erik Korsten on 14 August 2016.

The user has requested enhancement of the downloaded file.

Swarm and Switch: On the trail of the hibernating common pipistrelle

To be able to protect bats and their habitat, we have to know where they live and understand why they live there. Functional habitats, like roosts, commuting routes and feeding grounds, which are missed in surveys, are not being recognised as ecological needs and are not implemented in conservation strategies. Saying this, you might begin to comprehend the problems we face in conserving rare bat species, or bat species that live in areas which are inaccessible for bat research. But even in one of our most common bat species, the common pipistrelle, there are essential pieces of the ecological puzzle that are very hard to find, making a conclusive conservation strategy very difficult. One of those pieces is a very basic question about pipistrelles: where do they hibernate?

From studies on known pipistrelle mass hibernacula, and our experiences with accidently found sites in the Netherlands, we have developed and tested a methodology to identify and even confirm possible mass hibernacula of common pipistrelles in the urban landscape.

We share our summarised approach in this article, in order not to miss the 2016 swarming season, and challenge UK bat workers to test it in their own areas. We hope this will add to our findings and the conservation of these important sites. A more elaborate paper is being prepared.

Introduction

There is a big contrast between the known summer distribution of the common pipistrelle and the knowledge of its whereabouts in winter. In the case of the Netherlands the summer distribution covers the whole of the country with a carefully estimated summer population of 300,000 – 800,000 individuals. In winter however the annual hibernation surveys reveal not more than approx. 250 pipistrelles each year, at a total of 15-45 sites. In general these sites differ from the classical underground hibernacula. While most Daubenton's bats, Natterer's bats and whiskered bats are found in underground hibernacula, pipistrelles are mostly encountered in deep crevices in above ground buildings like castles, brick barracks or fortresses, brick kilns and some church towers. In most cases there are just 10-20 pipistrelles visible. So where are the rest hiding?

Most bat workers and text books will answer with: "*probably* in crevices in the same type of buildings as they use as summer roosts". This presumption is sometimes confirmed by the odd finding of a couple of pipistrelles during an ecological assessment or in the course of a renovation, but the numbers are still nowhere near the summer populations... so where are they?

A German swarming survey at a known hibernacula

We, Dutch bat researchers Eric Jansen and Erik Korsten, ran into the same questions. As we are both working on commercial development bat surveys as well as large scale distribution surveys in urban areas, we were often aware of the blind spot of pipistrelle hibernacula. At the same time we made observations that were often discussed as possible clues to hibernation sites. One type of observation was the annual event of large numbers of pipistrelles getting inside living or working areas of buildings in late summer. From the point of view of the inhabitants these events were often described as "*invasions*". The second type of observation was the midnight swarming behaviour of pipistrelles observed outside these buildings. These experiences in the Netherlands and our knowledge of some German bat research led us to some articles that put us on the right track to understand what was going on.

Between 1995 and 2000 German bat researchers did a thorough survey of the swarming behaviour at a known pipistrelle hibernation site in the cellar of the castle in the city of Marburg. From visual counts it was known that approx. 500 pipistrelles were hibernating in crevices in the ceiling of the cellar. Using an accurate automated entrance counter, it was revealed that in this cellar there

© Erik Korsten

Bats in expansion crevice on a balcony.

were in fact over 5000 pipistrelles hibernating, they just couldn't be seen by the surveyors. With this entrance counter and year round swarming surveys lasting over four years they discovered that over 20,000 pipistrelles visited the cellar for swarming and they revealed amazing annual patterns in swarming and hibernation behaviour. Between May and September common pipistrelles showed midnight swarming behaviour at this site, with a large peak of swarming behaviour in August on warm, windless nights. Most pipistrelles arrived in the cellar to hibernate during periods of frost and moved again with the first warmer days in winter, demonstrating a switching strategy during hibernation.

With the ringing and radio tracking of bats they also found that lots of pipistrelles caught swarming at the hibernation sites also visited other swarming sites on the same night. These other swarming sites were big apartment blocks and factory buildings, and in most of them annual summer/autumn "*invasions*" of sub adult pipistrelles in indoor areas had been known for many years (Sendor, 2002. Simon *et al.* 2004).

Turning it around: using swarming behaviour to locate unknown hibernacula

These results were pieces of the puzzle that we were trying to solve in our effort to design better city-wide bat surveys. First we tested if we could find midnight-swarming bats at our known invasion sites on warm nights in August. We could, and it was as easy as finding swarming bats at dawn surveys as maternity roosts in June. Using passive detectors to reveal this swarming behaviour by peaks in echolocation activity worked as well.

After that we tested if we could turn this method around and find previous unknown swarming sites in August by just cycling through urban areas listening and looking for swarming behaviour. We could, and we were surprised at how easy it was. For example, in citywide bat surveys by Bureau Waardenburg in Tilburg (119.2km^2 and 206,240 inhabitants) in 2013 and 2015 a total of 14 swarming sites were revealed.

The buildings with the most swarming behaviour showed a clear pattern: almost all of them were large apartment blocks with large (air-insulated) cavity walls and/or deep expansion crevices. This type of building probably offers the bats hibernation roosts they can rely on. The large mass of stone or concrete, and often also the internal heating result in crevices with microclimates that react very slowly to outside temperature changes. Deep or multiple crevices also enable the bats to choose the most optimal temperature to hibernate during certain weather conditions: sometimes close to, sometimes far away from the outside climate. And the urban landscape is normally a bit warmer then rural areas.

Common pipistrelle in expansion crevice.

Balcony of site where bats were found in expansion crevice (arrow).

Big buildings near commuting routes into urban areas might also be an advantage for the bats in locating other swarming bats and remembering their hibernacula. In an urban bat survey in the large city of Utrecht, the Dutch Mammal Society showed that pre-selecting potential swarming sites based on these large building features makes finding these swarming sites even easier. Within a few days more than fifty *pipistrelle swarming sites* were found.

Finding pipistrelles in winter time

Pinpointing possible mass hibernacula by late summer swarming behaviour is one thing, but how do we actually establish proof that bats are hibernating at these sites in winter? With bats being inactive most of the winter and hiding in crevices, searching for pipistrelles is like looking for a needle in a haystack.

First of all, finding late summer swarming behaviour narrows down the search to certain areas of the haystack: certain buildings and more specifically certain elements of that building. It helped that the German research also revealed that pipistrelles enter the hibernacula during frost periods and leave again on warm winter days. With passive detectors and weather data we soon showed that it was possible to reveal these activity patterns at some of the sites that were suspected to be hibernacula. Also visiting these sites with a bat detector in winter showed that pipistrelles swarm before entering the hibernacula in winter as well. Doing a detector survey at some apartment blocks while it was 2-7 degrees Celsius below zero was pretty surreal but successful *(https://youtu.be/9fVwlpidcQs)*.

Adding to that, in January 2015 we performed a thorough visual check of a building with swarming behaviour in August and peaks of swarming activity in the cold spells of winter. During a whole day of peeking into crevices, also with mirrors and snake cams, we found just over 500 pipistrelles (and two serotines) visible in expansion crevices between the balcony floors and the

Feature continues over page

© Herman Limpens

At each balcony there were dozens of pipistrelles hibernating in expansion gaps (arrows).

outer balcony walls. Because we sometimes saw several "layers" of bats in these deep crevices we estimated about 1,000-2,000 pipistrelles were present.

After giving some talks about the possibilities of finding these swarming and hibernation sites, other bat workers informed us about some possible sites. Bat worker and illustrator Peter Twisk found a group of 152 pipistrelles hibernating in a shallow four metre long expansion crevice, also between a balcony floor and a wall. Last winter, together with bat worker Ferry van der Lans, Erik found a group of over 80 pipistrelles hibernating behind some drain pipes in very mild winter weather.

Concern for the conservation of pipistrelle hibernacula

One of the first things that came to mind when we found that pipistrelles use these big buildings to hibernate was that many ecologists don't think of these buildings as possible bat roosts. Without this recognition there is a risk that these hibernacula are destroyed, and with bats present high numbers of pipistrelles being killed. Many of us know about these types of buildings being destroyed or renovated without a bat survey for swarming or hibernating bats being performed.

It is therefore important that survey techniques to find pipistrelle hibernacula are included in bat surveys undertaken by ecologists, and even better, that city wide bat surveys are performed to map these very important, but also very vulnerable roosts.

Summarised survey instructions

Finding late-summer swarming behaviour

- Midnight swarming behaviour peaks at hibernacula on warm nights with low wind speeds in mid to late August, between approximately two hours after sunset and two hours before sunrise.
- The swarming behaviour is very similar to dawn swarming, but with more bats landing on surfaces. Although swarming behaviour is visually and audibly (detector) conspicuous, with very tall buildings you might need a strong flashlight and binoculars to observe the bats. After some nights with swarming behaviour walls and floor may be covered in droppings.
- Searching behaviour is very similar to swarming behaviour. When you think you have a group of midnight swarming bats, revisit the same location a couple of times in the same night and the following nights to confirm real swarming behaviour.

Finding frost-swarming behaviour

- When you think you have found a pipistrelle hibernation site and you want to check the activity of swarming bats in winter: wait until the first period of frost and visit the site on a couple of the following nights into that frost period. Start one hour after sunset.

Buildings to look for pipistrelle swarming behaviour

- Buildings with annual invasions of many sub-adult pipistrelles flying inside in August are often large swarming sites or very close to one. They are good spots to start looking.
- In the Netherlands we have found large numbers of hibernating pipistrelles in several types of large buildings, ranging from apartment blocks, office or industrial buildings, churches and even castles. The presence of pipistrelles in the modern buildings might be a surprise, but don't forget the other buildings as well. In the UK apart from modern buildings, castles, church towers and big brick or concrete bridges or tunnels might be potential pipistrelle hibernacula as well.

If you go out to look for pipistrelle hibernacula and you find them, or if you have questions about our method, please let us know by e-mail. Together with you we can create a bigger picture and better ways to protect these vulnerable roosts.

Erik Korsten[1], Eric A. Jansen[2], Martijn Boonman[1], Marcel J. Schillemans[2] and Herman J.G.A. Limpens[2].
Corresponding authors: e.korsten@buwa.nl, eric.jansen@zoogdiervereniging.nl, herman.limpens@zoogdiervereniging.nl

© Erik Korsten

Typical pipistrelle hibernation site in Tilburg. Hibernacula in the cavity walls of the staircase building, and in large expansion gaps on ground level.

Thanks to Lisa Worledge for editing the article and thanks to Peter Twisk and Ferry van der Lans for sharing their experiences.

1 Bureau Waardenburg. 2 Dutch Mammal Society

References:

Sendor, Th. 2002. Population ecology of the pipistrelle bat (*Pipistrellus pipistrellus* Schreber, 1774): the significance of the year round use of hibernacula for life histories. Dissertation zur Erlangung des Doktorgrades der Naturwissenschaften. Fachbereich Biologie der Philipps- Universität Marburg, Marburg

Simon, M., S. Hüttenbügel & S. Smit-Viergutz. 2004. Ecology and conservation of bats in villages and towns. Bundesamt für Naturschutz, Bonn-Bades Godesberg.