Bat box fidelity of nathusius’ pipistrelle and pond bat

Anne-Jifke Haarsma & Jan Boshamer

Datum: 18 okt 2014
Locatie: Brasschaat
Presentation overview

• Description of our study
• Bat ecology
• Implementation of knowledge
Introduction (1/2)

- Start 1990
- 7 sites (2 minor)
- > 240 bat boxes

Migration along ‘afsluitdijk’
• In no bat’s land, bats discovered the first bat boxes within a month

• Hobby led to an increasingly scientific study

• We discovered our bat boxes were located along an important bottleneck during migration.
All bat boxes were opened and bats were handled

- Sex, age and biometric measurements were taken
- Some bats were marked (ring, transponder)
Material & Methods (2/3)

Lane (situation 1990)

Lane (situation 2013)

Forest edge

Shrubbery
Material & Methods (3/3)

3 types of bat boxes (since 2013)

Boshamer

Schwegler 2FN

Schwegler 1FF
Facts (1/2)

- All 7 sites were visited approx 3-4 each year
- > 1800 marked individuals
- > 2500 non marked bats
- Approx. 500 recovered individuals (within this study)
The following 7 bat species were observed:

- Nathusius' pipistrelle (*Pipistrellus nathusii*)
- Pond bat (*Myotis dasycneme*)
- Brown long-eared bat (*Plecotus auritus*)
- Daubenton’s bat (*Myotis daubentonii*)
- Common pipistrelle (*Pipistrellus pipistrellus*)
- Whiskered bat (*Myotis mystacinus*)
- Noctule bat (*Nyctalus noctula*)
Questions to audience (1/3)

1. Nathusius' pipistrelle are migratory. Do they also form local populations?
Seasonality

Some males establish their territory early & spend the summer.
Age

- Nathusius' pipistrelle = 8 years
- Pond bat = 20 years (* research Bels, Sluiter, van Heerdt)
Questions to audience (2/3)

2. Does every bat intent to select to most optimal site?

3. Is every bat able to select the most optimal site?
Selection (1/2)
Bat tend to inhabit every available bat box (we couldn’t find a selection criteria)

**GLM. Dependent variable = Rel % population**

<table>
<thead>
<tr>
<th></th>
<th>Nathusius' pipistrelle</th>
<th>Pond bat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Habitat</strong></td>
<td>N.S</td>
<td>N.S</td>
</tr>
<tr>
<td><strong>Orientation of entrance</strong></td>
<td>N.S</td>
<td>N.S</td>
</tr>
<tr>
<td><strong>Interaction between factors</strong></td>
<td>N.S</td>
<td>N.S</td>
</tr>
</tbody>
</table>
Selection (2/2)

Nathusius' pipistrell e

- Slight sign. preference for concrete bat boxes

Pond bat

- No sign. preference for bat box type
Questions to audience (3/3)

4. Are all individuals loyal to ‘their’ woodland/home range/bat box?
Fidelity to one of seven sites

<table>
<thead>
<tr>
<th>Species</th>
<th>Sex</th>
<th>Age</th>
<th>Different site as first captured</th>
<th>Same site as first captured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nathusius' pipistrelle</td>
<td>f</td>
<td>Subadult</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>f</td>
<td>Adult</td>
<td>10,7 %</td>
<td>89,3 %</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>f</td>
<td>Unknown</td>
<td>7,2 %</td>
<td>92,8 %</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>m</td>
<td>Subadult</td>
<td>37,5%</td>
<td>62,5 %</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>m</td>
<td>Adult</td>
<td>2,7 %</td>
<td>97,3%</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>m</td>
<td>Unknown</td>
<td>0,2 %</td>
<td>98,8 %</td>
</tr>
</tbody>
</table>

→ Sub adult change more often than adults
Harem size (Nathusius' pipistrelle)

Size of female group is Sign (-) related with age (in days)
Subadult often mix with adult males (sneak-mating or followers?)
Fidelity of individuals to home range (1/2)

• 141 indiv >4X recovered (hence they were handled >5 times).
• A total of 891 recoveries (max 21 of 1 indiv).
• Only males were observed >4x
• 9 indiv changed between sites (not included)
Fidelity of individuals to home range (2/2)

51 individuals were found at least 5 times within the same ‘home range’

<table>
<thead>
<tr>
<th>Species</th>
<th>Age</th>
<th>Home range switching individuals</th>
<th>Individuals with ‘home range fidelity’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pond bat</td>
<td>Subadult</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pond bat</td>
<td>Adult</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Pond bat</td>
<td>Unknown</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>Subadult</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>Adult</td>
<td>48</td>
<td>32</td>
</tr>
<tr>
<td>Nathusius' pipistrelle</td>
<td>Unknown</td>
<td>14</td>
<td>5</td>
</tr>
</tbody>
</table>
## Tentative hypotheses

**Live and learn. During their life bats go through 3 stages**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Experience</th>
<th>Behaviour</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 sub</td>
<td>Little</td>
<td>Opportunistic Sample divers range of roosts</td>
<td>Dispersion Colonization new sites Some break with tradition/tactic Not always safe (indiv can make dumb choices)</td>
</tr>
<tr>
<td>2 Prime</td>
<td>More</td>
<td>Traditional More or less persistent in selection of site</td>
<td>Mostly safe tactic, but not flexible (e.g. change climate) Social effect (song flight/lek-mating, attract more indiv to preferred site)</td>
</tr>
<tr>
<td>3 Mature</td>
<td>A lot</td>
<td>Idem, with less mating</td>
<td>Idem</td>
</tr>
</tbody>
</table>
Implementation of knowledge (1/2)

How to implement the knowledge of site fidelity (f.e. protection)?
Implementation of knowledge (2/2)

In our opinion:
- A roost of an adult male is of more value than a roost of a subadult male.
- Hence, it is not essential for a population to protect/compensate every roost
- Information of the age of an individual can help as a selection criteria
- adult bats do not want to change. If we want to compensate its roost, we must take this into account.

Note:
we think bat boxes are not a suitable compensation measure.
Further research

• Difference between wood concrete and wooden bat box (Schwegler FN2/FF versus Boshamer)
• Bat boxes as method to study migration routes (along coast/large water bodies)
• Relation between forest maturity and diversity of species
• Measure ‘Sun exposure’ (Wind orientation ≠ sun exposure)
Conclusions

• Males year-round, females autumn to spring
• The harem size of males changes (~ older males tend to have smaller harems)
• Large fidelity to sites (especially adults)
• Within site, some individuals show large home range fidelity
Discussion

- The forest matured significantly during the last 20 years
- Logging with a tendency to harvest the oldest trees may keep the availability of natural cavities constant
Acknowledgements

• All volunteers helping during the surveys
• Photographers
• Nature organisations
  – Staatsbosbeheer
  – Landschap Noord-Holland
Thanks for your attention!

• Questions?