



‘Can you see what I see?’ –

The importance of night vision aids to conduct effective emergence surveys of tree roosting bats

Ian Davidson-Watts

Trees surveys for bats are challenging!



Current guidelines

Bat Conservation Trust
**Bat Surveys for
Professional Ecologists**
Good Practice Guidelines



3rd edition

- BCT Guidelines – Night vision aids are a ‘Complimentary method’
- Assist with precision and darker sites
- Use of IR/Thermal becoming more frequent
- Eurobats recommend IR Cameras for barbastelle and Bechstein’s bats



Aims

- Can effective bat emergence surveys of trees be done without night vision aids?
- Is the bat species/group relevant to survey effectiveness?
- Does broad roosting habitat influence survey effectiveness?
- Does the roost type/status influence survey effectiveness?



Methods- Finding Tree Roosts

Catch bat



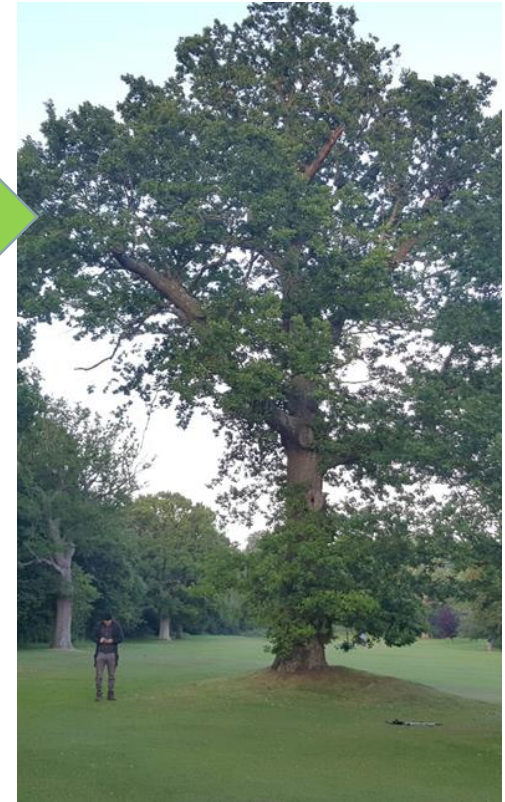
Tag bat



Track bat



Find roost



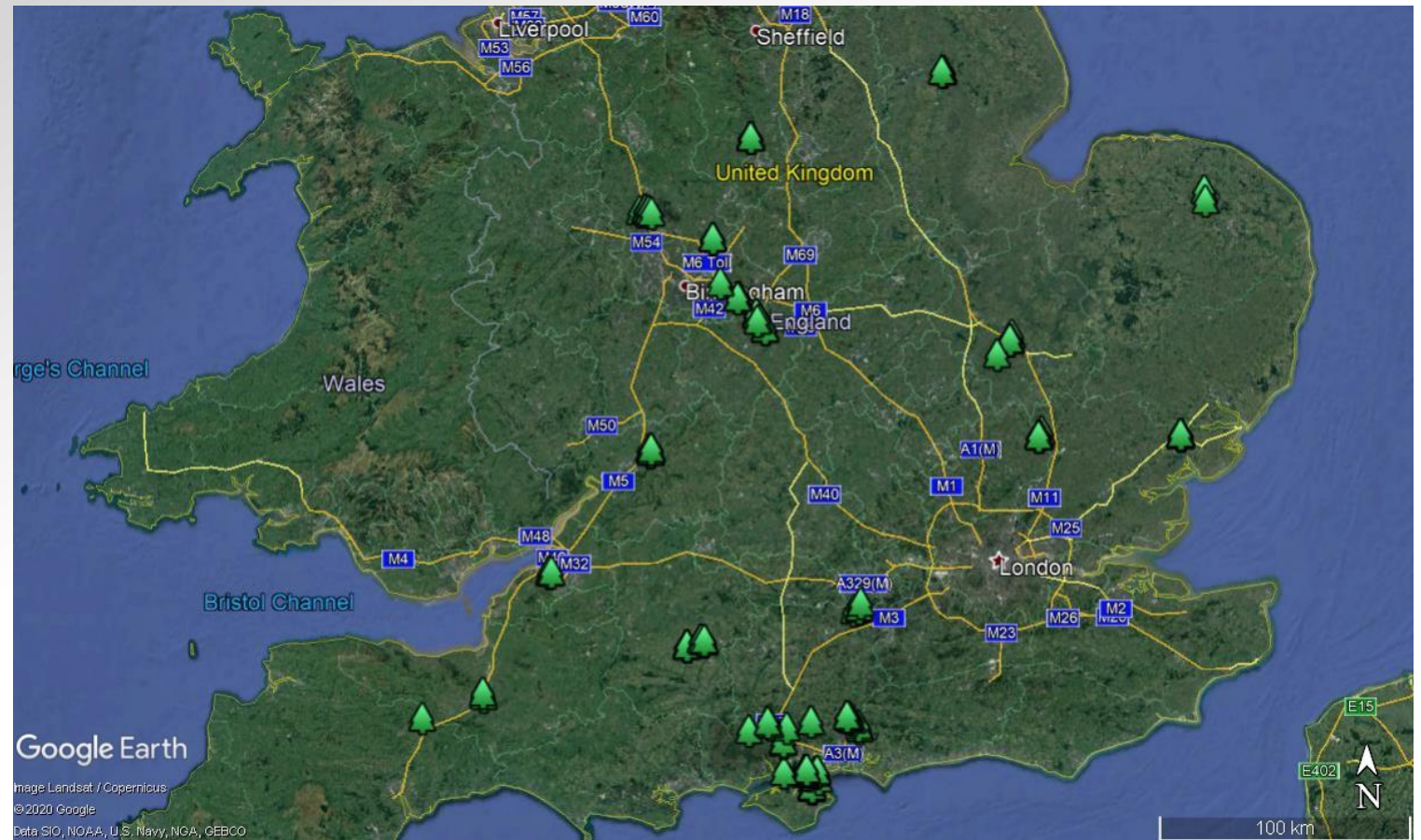
Methods – Emergence Survey



- Time first bat emerged
- Time tagged bat emergence
- Time last bat emerged
- Time roost feature not visible without night vision device

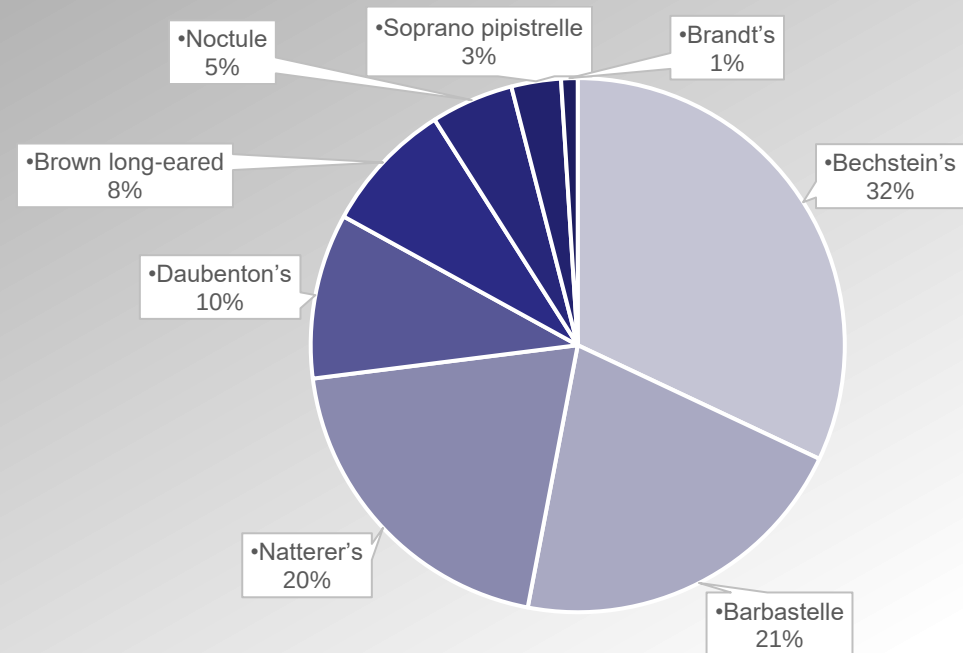
Results

- 100 roost sites located across 16 English Counties from which emergence surveys were undertaken between 2013-2019



Roost emergences

Proportion of roosts by species

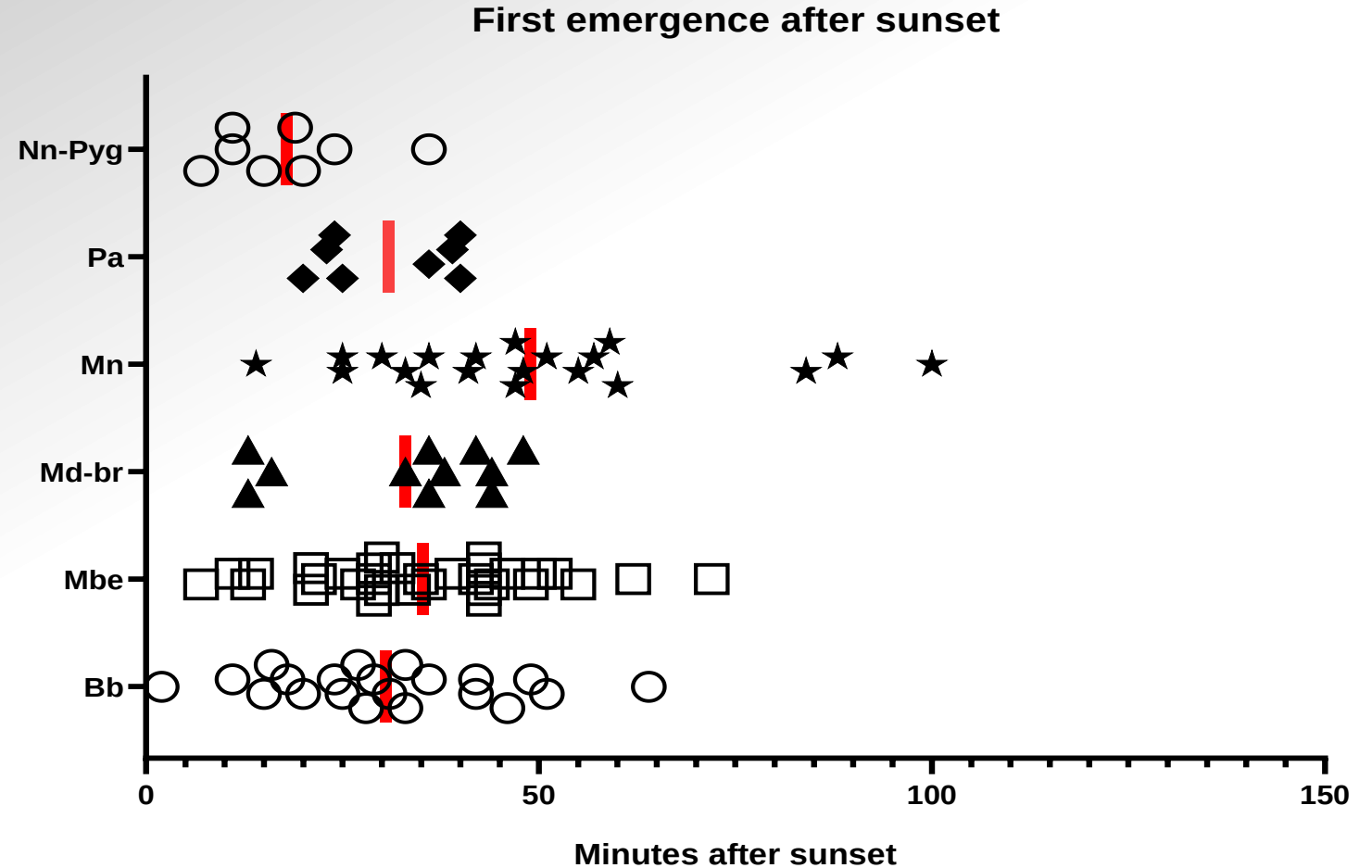


- At 74 roost sites bats were visually observed emerging
- 26 sites bats were not visually observed at all



Mean emergence time after sunset

<i>Spp</i>	<i>n</i>	Min"	Max"	Mean"
Bb	21	2	64	30.6
Mbe	32	7	72	35.3
Md/br	11	13	48	33.0
Mn	20	14	100	48.9
Pa	8	20	40	30.9
Nn/Pyg	8	7	36	17.9



What did the IR cameras see?



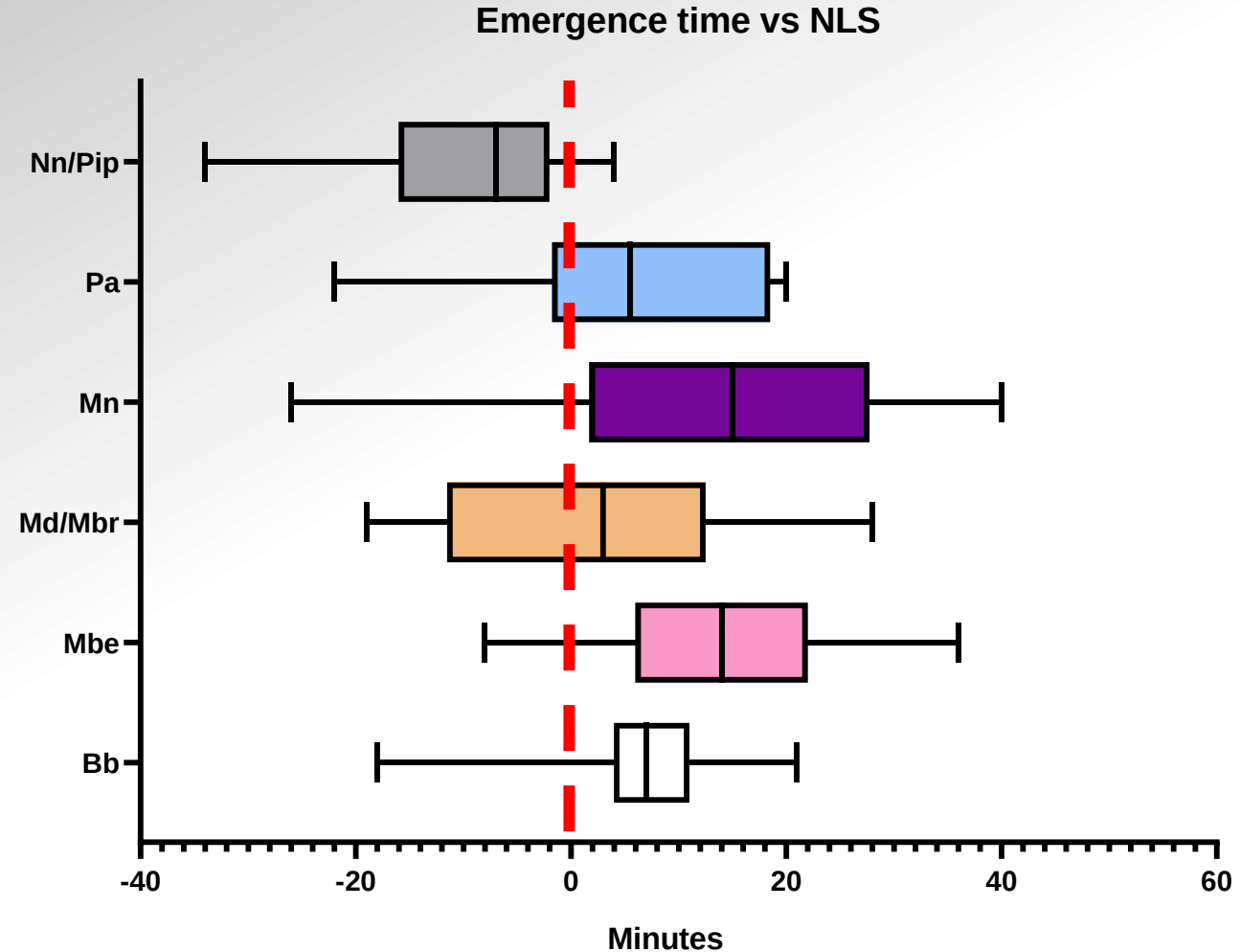
When did bats emerge in relation to NLS?

- 74 observed roosts
- Inside woodland PRF NLS – 20min after sunset
- Outside woodland PRF NLS – 29min after sunset
- Pooling all data- bats emerged on average 8 minutes after NLS
- However, 22% of emergence surveys saw bats emerge prior to NLS
- ANOVA - significant differences occurred between species/groups ($H(6) = 17.21, P = 0.0014$).



Emergence in relation to PRF 'NLS'

<i>Spp</i>	<i>n</i>	Min"	Max"	Med"
Bb	15	-18	21	7
Mbe	27	-8	36	14
Md/Mbr	10	-19	28	3
Mn	10	-26	40	15
Pa	6	-22	20	5.5
Nn/Pip	6	-34	4	-7



What factors influence unaided emergence surveys of tress?

- Bat species?
- Habitat?
- Type of roost?
- Time of year?
- Size of the roost?



Probability of observing bat emergence without night vision

Logistic regression

Predictor variables:

- roost feature (feature) – cavity, not cavity or Not Seen (NS).
- habitat type (habitat) – woodland or not woodland.
- roost status (roost) – maternity or day (including mating).
- bat species group 1 (batasp1) – Bb, early emergent species (Nn and Ppyg), Mbe, other Myotis species (Mn, Md and Mbr), and Pa.
- bat species group 2 (batasp2) – cluttered habitat species, (Mn, Md, Mbr, and Pa), early emergent species (Bb, Nn and Ppyg), and Mbe.
- Survey month (month)
- Size of the roost (number of bats present)



Logistic regression- Top ranked models

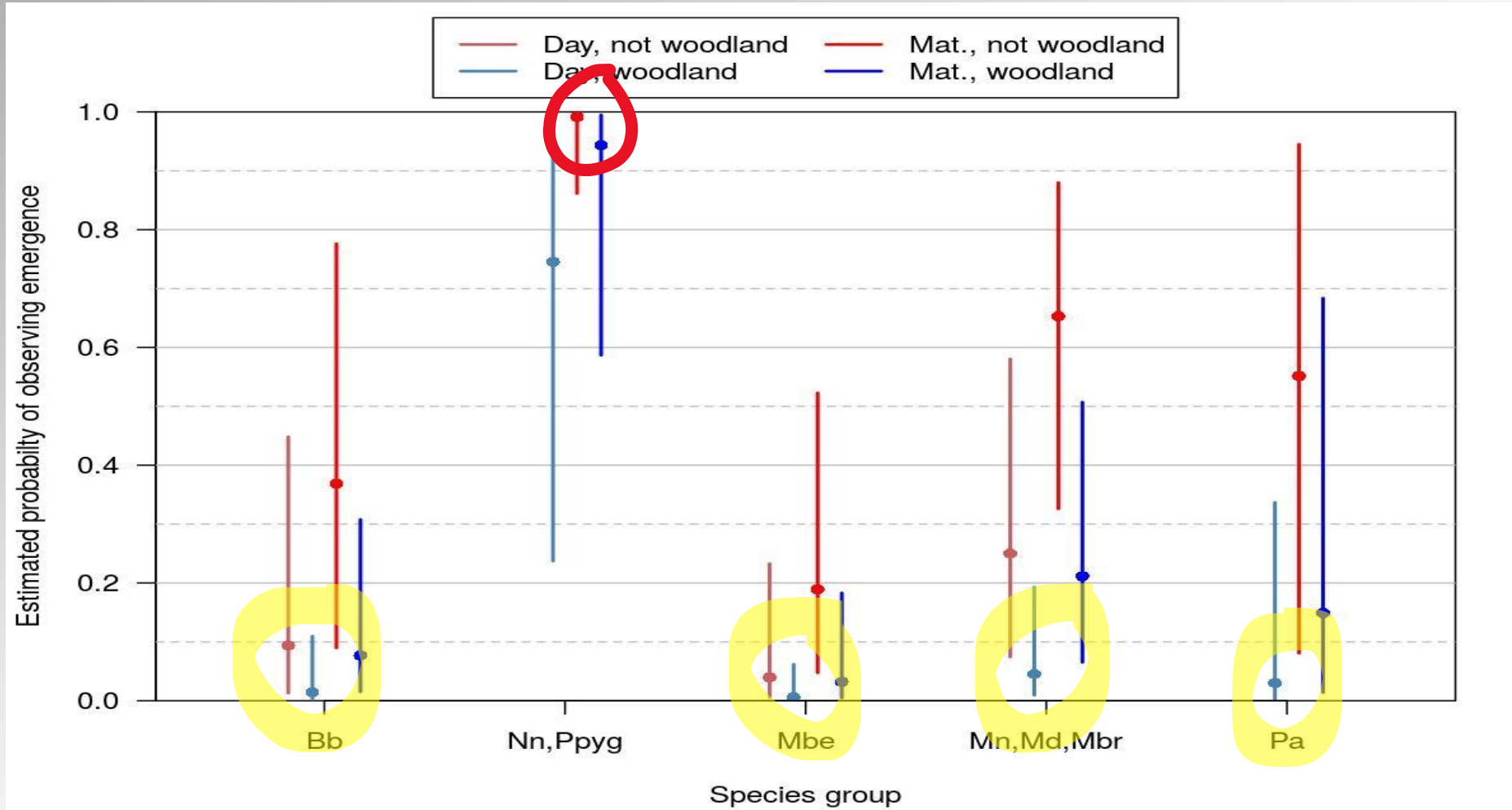
72 models were fitted

Summary of the AIC model selection procedure for the logistic regression analysis of the probability of observing bat emergence. Results for 12 highest ranked models are presented.

Model	ΔAIC	w	N_{par}	Dev
<i>batsp1+roost +habitat</i>	0.00	0.45	7	59.39
<i>batsp1+roost +habitat +month</i>	2.31	0.14	11	53.70
<i>batsp1+roost +habitat + feature</i>	3.40	0.08	9	58.79
<i>batsp1+habitat</i>	3.99	0.06	6	65.39
<i>batsp1+habitat +size</i>	4.00	0.06	7	63.39
<i>batsp1+habitat + feature</i>	5.00	0.04	8	62.39
<i>batsp1+roost</i>	5.60	0.03	6	67.00
<i>batsp1+roost +habitat + feature+month</i>	5.66	0.03	13	53.05
<i>batsp1+habitat + feature+size</i>	6.52	0.02	9	61.91
<i>batsp1+habitat +size+month</i>	6.65	0.02	11	58.04
<i>batsp1+habitat + feature+month</i>	6.70	0.02	12	56.09
<i>batsp1+habitat +month</i>	7.16	0.01	10	60.55



Estimated probability of observing emergence from top-ranked model that included bat species group 1, roost status and habitat as predictor variables. 95% confidence intervals are also presented.



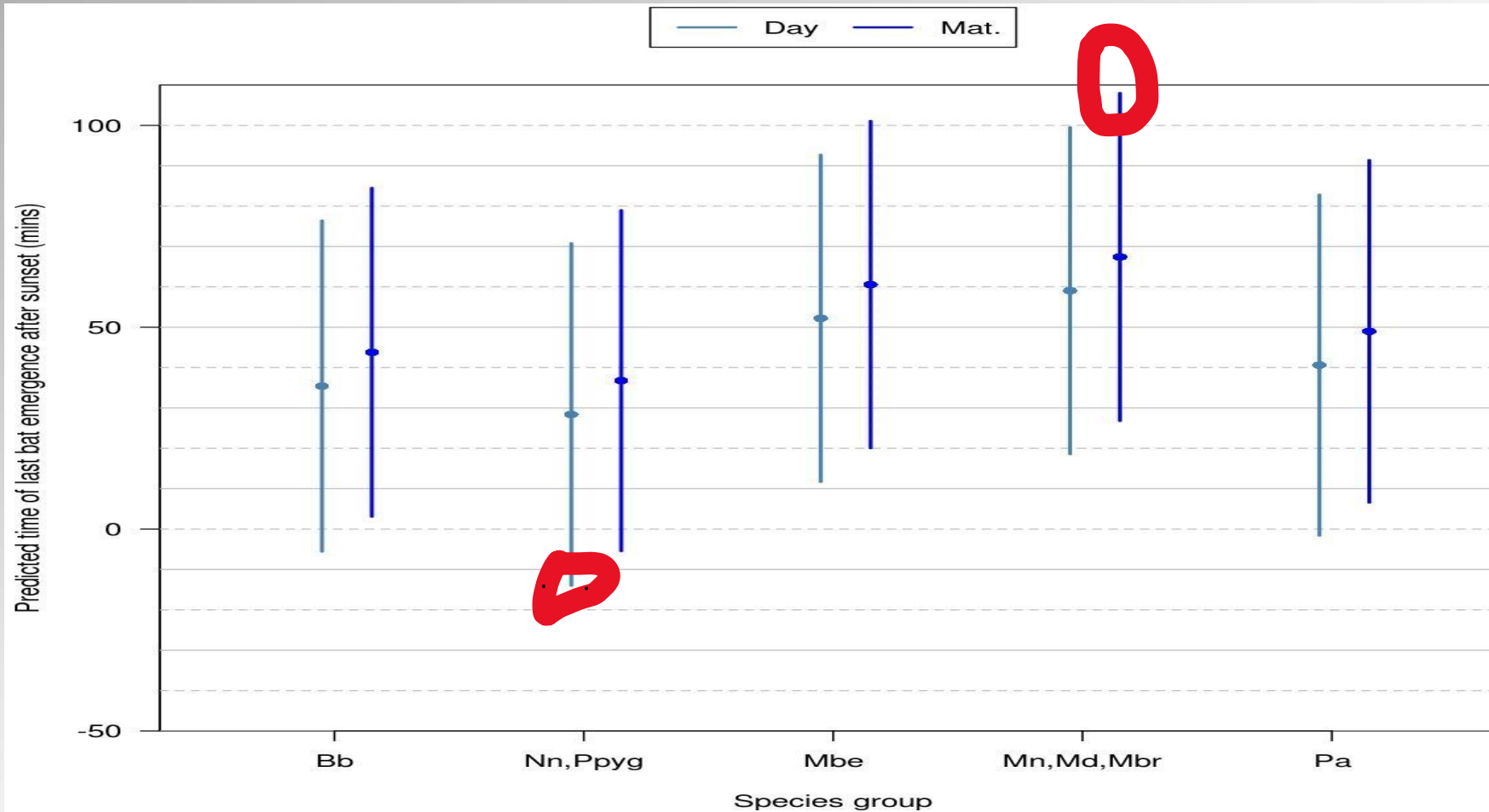
A public service announcement from the Ministry of the Bleeding Obvious

**“Humans can’t do effective emergence surveys for all
bat species without night vision aids”**



I can't see,
its too dark

Predicted time of last bat emergence after sunset from the top-ranked model that included bat species group 1 and roost status as predictor variables. 95% prediction intervals are also presented.

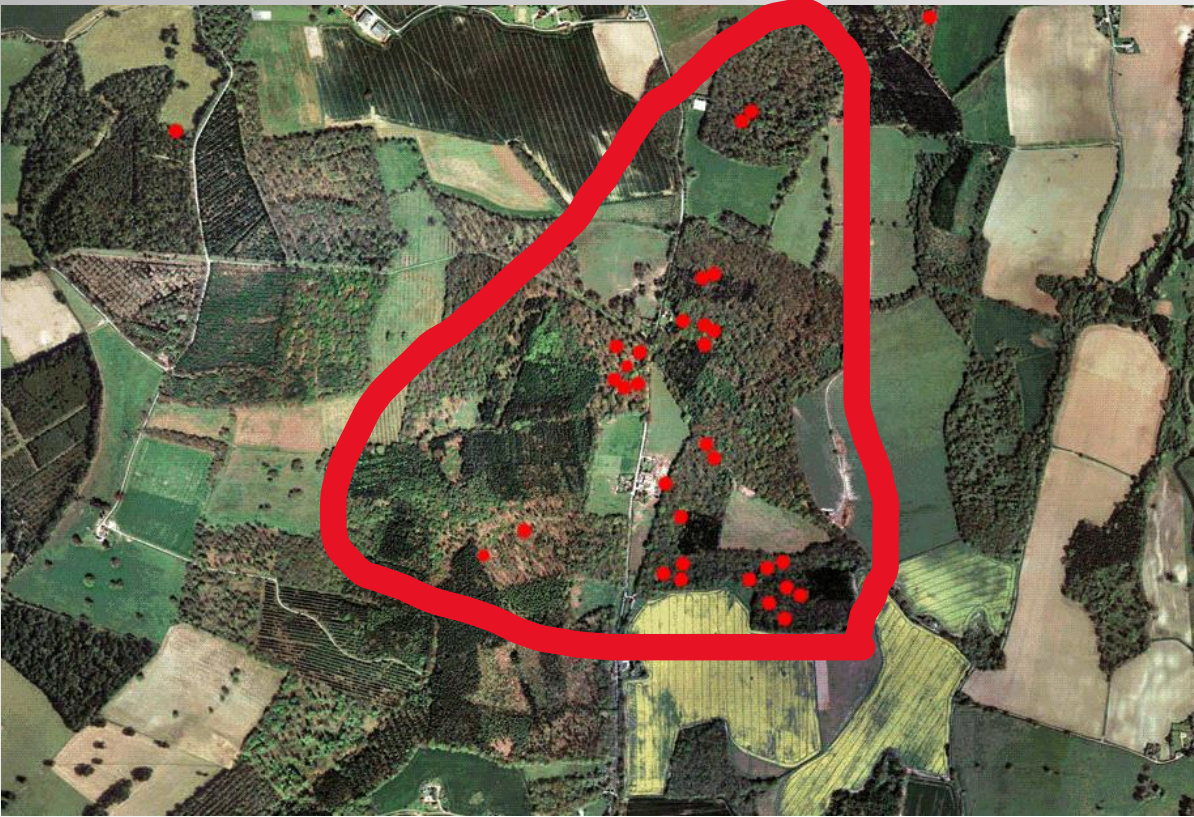


Conclusions

- Chances of observing a bat dependent on a range of factors:
 - Species
 - Habitat
 - Type of roost
- Even with night vision aids, surveys are challenging- circa 25% tagged bats still not observed emerging.
- Duration of surveys recommended by guidelines is about right.
- However if you can't see the PRF, your survey becomes a fixed-point activity survey



Are we approaching surveying tree roosts in the right way?



- Low encounter rates of tree roosting bats
- Habitat population approach?
- Proportionality based on risk and impact

Acknowledgements

The surveyors

- Mike Bird
- Alan Crane
- Jade Flear O'Rourke
- Anton Kattan
- Rob Pelc
- Tom Foxley
- Matt Zeale
- Chris Greenland
- Alex Perry
- David Hill
- Graham Street
- Jon Cox

The Enablers

- Lincs Bat Group
- Herts and Middlesex Bat Group
- Hampshire Bat Group
- Wiltshire Bat Group
- IOW Bat Group
- Natural England
- Diane Davidson-Watts
- Darryl McKenzie (Proteus NZ)

The Sponsors

- Ramboll
- WYG
- Arup
- Aecom
- WSP
- Stantec/PBA
- Mott McDonald
- Alder Ecology
- PTES
- Biocensus
- Ethos Environmental
- Land and Partners
- Atkins
- Thomson Environmental
- The National Trust
- Eastleigh Borough Council

Questions?

