Use of thermal imaging to count roosting and exiting Southern Bent-wing Bat in SW Victoria.

Mark Venosta, Biosis Pty Ltd, 38 Bertie St, Port Melbourne 3207

Email: mvenosta@biosis.com.au

1. The Project:

- In response to impact assessment requirements for a proposed wind farm, we have been undertaking exit and roost counting at Byaduk Caves, Victoria (Fig 1).
- The aim is to obtain an accurate estimation of numbers of the critically endangered SBWB roosting at Byaduk Caves and other caves in the region.

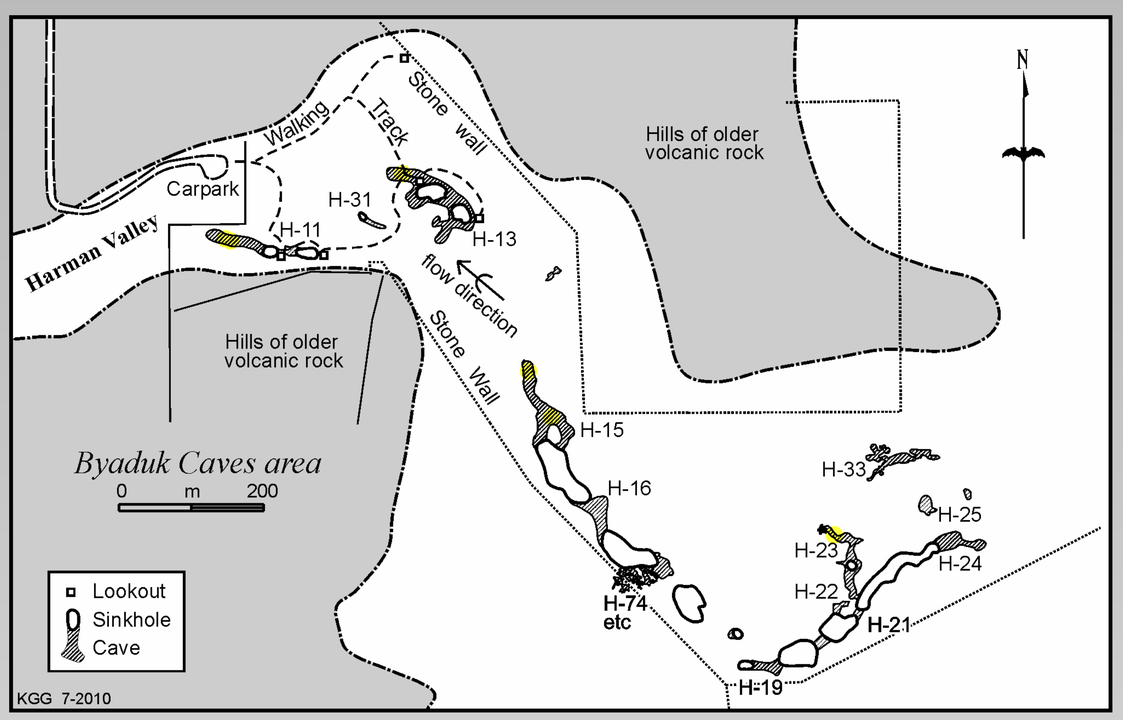


Figure 1. Byaduk caves. Yellow shading indicates bat occupation/signs of occupation. Figure sourced from the Victorian Speleological Association.

The critically endangered Southern Bent-wing Bat *Miniopterus schreibersii bassanii*. Photo supplied by Terry Reardon

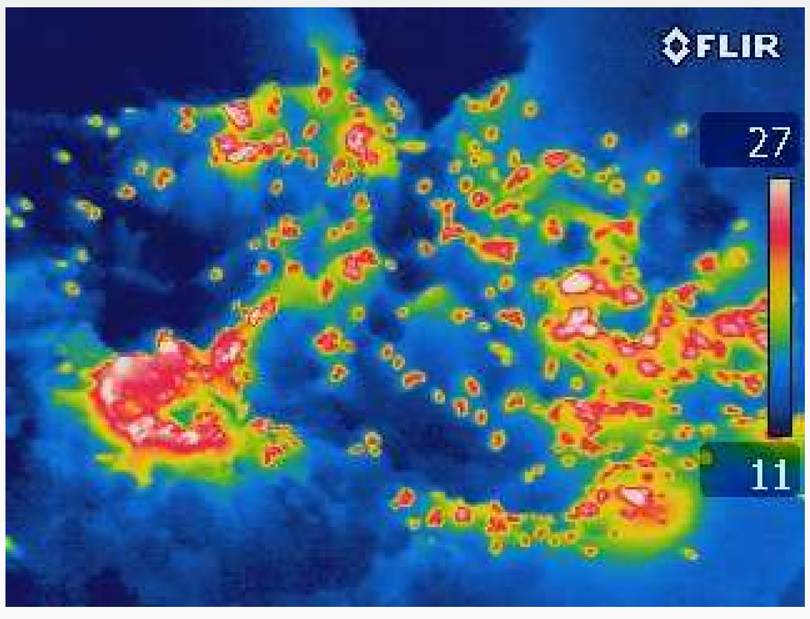
Figure 2. Highly portable thermal camera and DVR *in situ* at edge of collapsed lava tube at Bridge Cave (H-13). (Anabat detector on right).

2. Methods:

- A thorough review of bat occupation and inspection of caves within the region (Mt Napier, Mt Rouse and Mt Eccles) was undertaken.
- A thermal camera was used to investigate occupation at each cave.
- Guano deposits were also documented.
- Initial attempts at exit counting with infra-red were abandoned in favour of thermal imaging.
- The cave entrances are large, being located at the ends of collapsed lava tubes.
- Four thermal cameras (Flir E60) were deployed at each cave entrance (perpendicular to bat exit flight direction) and the bat exodus recorded for up to 1.5hrs (Fig 2).
- A hand held 100Gb DVR was used to record the footage (Fig 2).
- Counting was initially done manually post exit count. After more significant numbers of bats were detected in Feb 2012 automated counting was employed.
- Infra-red lighting and an infra-red capable video camera were used to count roosting bats within caves.

Missile tracking software:

- Methods used followed Milton *et al.* (2005) who also provide a useful manual for working with their T3 tracking software.
- Thermal footage is recorded live to DVR.
- Footage is later played through a video camera via FireWire and captured by T3 on laptop.
- This file is then processed by T3 and individual bats are assigned pixel clusters, which the program can then count based on pixels that represent a bat passing through a designated polygon.



Thermal image of roosting SBWB in Church Cave

3. Results:

- Four caves at Byaduk contain evidence of occupation by SBWB.
- Infra-red techniques considered inferior to thermal imaging.
- Infra-red was still useful for counting roosting bats, particularly when counting individuals clustered together.
- Thermal methods were not useful for counting masses of roosting bats.
- Exit and roost counts undertaken in Oct and Dec 2011 revealed very few bats as being present.
- Counts in late Feb 2012 revealed an increase in numbers at all caves, with a large increase (~500 SBWB) at Church Cave (H-15).
- Counts conducted with T3 missile tracking software throughout 2012 confirmed 507 SBWB exiting from Church Cave (H-15).

4. Conclusions:

- Thermal imagery combined with T3 tracking software works well for counting exiting bats, particularly in this instance where the cave entrances are relatively large.
- Infra-red methods proved difficult and provided less reliable exit count results. Infra-red has still proved useful for counting roosting bats with minimal disturbance.
- Counts will continue until late 2012 to gather local population data over a 12 month period.

Reference: Melton, R.E., B.M. Sabol, and A. Sherman, 2005, *Poor man's missile tracking technology: thermal IR detection and tracking of bats in flight*. Proceedings International Society of Optical Engineering (SPIE) vol. 5811:24-33

Acknowledgements: Ken Grimes for speleological expertise and guiding, Felicity Humann, Thea Shell, Marion Shadbolt, Gavin Thomas, Katie Stevenson for field assistance and co-ordination, Kristen Lear for T3 expertise and Lindy Lumsden for equipment and discussion.