

AN AMERICAN in AUSTRALIA: MONITORING the MATERNITY COLONY OF SOUTHERN BENT-WING BATS (*Miniopterus schreibersii bassanii*) at NARACOORTE CAVES NATIONAL PARK, SOUTH AUSTRALIA

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Abstract

The Southern Bent-wing Bat (*Miniopterus schreibersii bassanii*) is an obligate cave-dwelling bat with a restricted distribution, occurring only in southeast South Australia and southwest Victoria. It is currently listed as Critically Endangered due to a severe population decline from an estimated 100,000 - 200,000 individuals in the 1960s to approximately 30,000 individuals in 2009. In addition, this species is dependent on just two maternity caves: Bat Cave in Naracoorte, South Australia and Starlight Cave in Warrnambool, Victoria. From September 2011 to September 2012, I will be based at the Naracoorte Caves National Park to carry out my U.S. Fulbright Postgraduate Scholarship. The purpose of my study is to accurately estimate population numbers and trends at the Bat Cave maternity site so we can better understand how the population functions throughout the year. The information gathered from this project will help guide management strategies that will aid in the recovery of this Critically Endangered species. In addition, I will participate in community outreach projects throughout the year to help bring awareness and understanding of bats to members of the public.

Introduction

I graduated from Ohio Wesleyan University (United States) in May 2011 with a B.A. in Zoology and am in Australia for a year on a U.S. Fulbright Postgraduate Scholarship. The Fulbright Program is the largest U.S. international exchange program that supports students, scholars, and professionals to undertake research, teaching, or study in countries worldwide. I arrived in Australia in September 2011 and am spending the year at Naracoorte Caves National Park, South Australia to study the Southern Bent-wing Bat (*Miniopterus schreibersii bassanii*). While the Southern Bent-wing Bat is one of the most-studied Australian bat species, there is still much to learn about its ecology and the threats it faces. The aim of my project is to monitor the bats at the Bat Cave maternity site. I am working closely with Terry Reardon of the South Australian Museum, Steve Bourne of the Naracoorte-Lucindale Council, Lindy Lumsden of the Victorian Department of Sustainability and Environment, and Dr. Belinda Appleton of the University of Melbourne to conduct my project.



Southern Bent-wing Bat miniopterus schreibersii bassanii
Photo: Steve Bourne

The Southern Bent-Wing Bat

The Southern Bent-wing Bat was listed as Critically Endangered under Australia's Environment Protection and Biodiversity Conservation Act of 1999 based on the fact that the sub-species has undergone a reduction in population of about 67% over three generations and that it has a highly restricted range, relying on only two maternity caves (Bat Cave in Naracoorte, South Australia and Starlight Cave in Warrnambool, Victoria). During the non-breeding season (April to August) individuals are distributed throughout the region, roosting in over 48 caves and rock crevices. In late August, however, the bats migrate to one of the two maternity caves, Bat Cave in Naracoorte, South Australia or Starlight Cave in Warrnambool, Victoria. These caves have unique structural characteristics which allow heat and humidity to reach ideal conditions for nursing young babies (Dwyer and Hamilton-Smith 1965). By October the migration is complete, with the



The author inspecting a bat, Bat Cave, Naracoorte.
Photo: Steve Bourne

majority of both males and females (70% to 90% depending on the year) going to the Naracoorte Bat Cave.

The population size of the Southern Bent-wing Bat has declined dramatically in the last 50 years. In the 1950s and 1960s, there were an estimated 100,000 – 200,000 individuals at Naracoorte, the largest of the maternity caves (Dwyer and Hamilton-Smith 1965). Exit counts using video recording revealed that by 2001, numbers had declined to 35,000, and by 2009, the estimate was a mere 20,000 individuals (Bourne 2010, Kerr and Bonifacio 2009). At Warrnambool, the bat population declined from approximately 15,000 to 10,000 individuals over the same time period (Dwyer and Hamilton-Smith 1965, Gray 2000, Grant and Reardon 2004). Numerous threats have been proposed as potential factors in this decline, including loss and modification of roosting and foraging habitat, human disturbance, pesticides, disease, changes in food availability as a result of drought, and climate change.

The goal of my project is to accurately determine population numbers and trends at Bat Cave from



*Installing a data logger to record temperature and humidity near the nursery in Bat Cave, Naracoorte.
Photo: Steve Bourne*

September 2011 to September 2012. A large part of my project is to collect regular emergence counts so we can better understand how the population functions throughout the year, specifically when the bats arrive at the maternity cave, how activity levels vary seasonally and on a nightly basis based on weather conditions, when the young commence flying, and the level of breeding success based on the proportional increase in numbers leaving the cave. Monitoring throughout the year will allow us to detect issues that can be resolved with management intervention, and the information gathered from this study will help guide management strategies that will aid in the recovery of the Southern Bent-wing Bat.

Methods

I arrived in Naracoorte to begin my Fulbright scholarship in early September 2011. I am using two thermal imaging cameras (FLIR Photon 320 NTSC) and an automated counting system (Thermal Target Tracker (T3) System) based on missile tracking technology. The T3 software uses the bats' continuous flight motion to track each bat frame to frame within a video recording. The software gives output that includes egress (the number of bats emerging), ingress (the number of bats returning), and net emergence. The software also outputs an Excel file with a minute-by-minute count. I then verify a few of those one-minute counts against my own manual counts, and I run the video through different parameters as needed to get accurate numbers. I began taking emergence counts at Bat Cave in early September and have taken, on average, two to three counts per week.

Results and Discussion

My project so far has yielded some interesting results about the population of Southern Bent-wings Bats at Bat Cave including:

- The number of bats increased in the spring as individuals returned to the maternity cave from non-breeding sites. This was expected, as typically the majority of the population returns in August or September from over-wintering sites to Bat Cave, where the females give birth to and raise their young.
- Throughout the summer we have seen regular fluctuations in the number of bats present (up to 10,000 individuals per night), indicating that significant numbers of bats may use surrounding caves during the maternity season. We know from previous studies that Southern Bent-wing Bats use over 48 caves throughout South East SA as over-wintering sites (Mott and Aslin 2000), but the results from my project indicate that a significant proportion of the population may temporarily leave Bat Cave and use these surrounding caves during the summer as well.
- Our preliminary results also show an increase in peak population size from previous years. The highest number recorded for the 2011-2012 maternity season was 40,464 bats in mid-

February, 2012. This is a marked increase from the numbers recorded in previous annual summer video counts that showed a steady decline from 35,000 in 2000 to 21,000 in 2008 (Bourne 2010, Kerr and Bonifacio 2009). However, these counts were only taken one to three times per summer and may have been taken at times when a significant proportion of bats had temporarily left Bat Cave. These counts likely do not provide reliable estimates of the population size during those years, and we therefore cannot assume a sustained growth in population. More regular population counts are needed in order to get accurate numbers and determine population trends over the years.

These results highlight the importance of continued monitoring at Bat Cave throughout the year over multiple years. Effective management of surrounding caves that may be important roosting sites for the bats both in the winter and summer is also vital. I will continue monitoring the population at Bat Cave until the bats depart for their overwintering sites, and then begin again once they return in the spring. At the end of my project, I will submit a report to the South Australian Department of Environment and Natural Resources for use in a management and recovery plan for the Southern Bent-wing Bat. I hope the information gathered from this project will contribute to the conservation of this species.

Future Plans

The conservation and management of the Southern Bent-wing Bat is an ongoing endeavour. Future plans at Naracoorte Caves National Park include the installation of a permanent viewing station outside the cave entrance which will display the thermal imaging counts in real-time for visitors. Due to the sensitivity of the thermal equipment, it is currently impossible to take counts when it is raining, meaning that we miss information about the bats' behaviour on wet nights. The viewing station will allow us to take counts in inclement weather so we can gather more accurate information regarding the bats' behaviour in all types of weather.

In addition, Terry Reardon and students at the University of South Australia are developing a laser beam counting system that will remotely measure bat activity at the cave and provide us with an index of activity throughout the night. While the laser beam system will not show actual numbers, the information it provides will allow us to determine when the bats begin returning to Bat Cave in the spring, at which time we can begin taking regular thermal imaging counts.

Regular monitoring of Bat Cave throughout the summer months is important in order to get accurate population counts. However, due to the fluctuations in numbers at Bat Cave throughout the summer and the likelihood that bats are using surrounding caves during this time, additional monitoring of other caves in the South East region during the summer is needed. These checks should be targeted at times when the emergence counts from Bat Cave show a decrease in the population. A concerted effort should be made to conduct several one-



Inspecting Joanna Bat Cave, Naracoorte, with Catherine Sellars and Chris O'Connell. Photo: Steve Bourne

day summer cave surveys of all the major surrounding caves to determine if bats are using these caves and if so, which caves are of most importance and should be targeted for specific management measures.

Conclusion

The preliminary results of this study highlight the importance of regularly monitoring the Bat Cave population throughout the year, over multiple years, to accurately assess population numbers and trends and determine overall population health. In addition, it is also vital to monitor and manage caves in South East South Australia for use by Southern Bent-wing Bats throughout the year.

Community Outreach

In addition to working on my research, I have been working in the local community to bring awareness and understanding of bats to members of the public. I have given several class presentations about bats to the students at the Naracoorte High School. They recently began their unit on ecology, so my presentations focused on bat diversity and how bats are important to the

ecosystem, as well as teaching the students about some of the bats and bat habitats in their own backyards. I am also helping with an after-school Youth Creating Habitat group comprised of a handful of the students. We are planning to install several bat houses in the creek site behind the high school and do a trapping session to survey the bat species present. These activities will be a great way to get the students involved with hands-on bat conservation in their own community. I am also planning to give several bat presentations to primary school students during the World Day for Biological Diversity on May 22.

I have also been volunteering with the Naracoorte Girl Guides, which has provided a great opportunity for me to continue my 17-year involvement with Girl Scouting and has provided a perfect outlet for me to share my passion for bats with girls from the local community. The girls (aged 7 to 15) are eager to learn more about bats and my research at the park. At their recent end-of-year campout, I took them to the park's Bat Observation Centre, where we watched the bats in the cave with infrared cameras. The girls were surprised to learn that the bats do not sleep through the entire day, and they enjoyed watching the bats grooming themselves and flying around the cave. Later that evening, we sat outside Bat Cave and watched the emergence. The girls were thrilled to be so close to the bats as they flew out of the cave. By the end of the campout, they had decided to use some of their unit money to Adopt-A-Bat from Bat Conservation International (BCI), which will help BCI preserve and protect bats around the world.

I am thrilled to be able to share my passion for bats with members of the community while in Australia. I hope to continue to bring awareness and understanding of bats to members of the public so they develop a vested interest in the conservation of these much-maligned animals.

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A skeleton of a Southern Bent-wing Bat still clinging to the roof of Marcollat Cave, Naracoorte.

Photo: Steve Bourne

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