Part 1 - Summary Details

CRDC Project Number: **CRC57**

Project Title: Microbats in changing cotton landscapes. A case study from the Namoi River

Project Commencement Date: **Project Completion Date:**

CRDC Program: Catchment & Environment

Part 2 – Contact Details

Administrator: (Name & position of officer responsible for all correspondence).

Organisation: (Organisation administering the research project).

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Supervisor: (Name & position of senior scientist overseeing the project).

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Signature of Research Provider Representative: _____

Part 3 – Final Report Guide (due 31 October 2008)

Background

This study has investigated the links between microbats, cotton production and native vegetation across three cotton production properties (56²km) adjacent to the Namoi River between Narrabri and Wee Waa on the north west plains of NSW.

Four landscape surveys were conducted, an autumn 2003 exploratory survey, and three seasonal surveys during the 2003/04 cotton-growing season. Microbat ultrasound echolocation was recorded with an Anabat recorder for 20 minutes at 102 exploratory sites, and 64 seasonal sites between either civil twilight or sunset and midnight. Climatic and moon cycle data was collected during each 20 minute sample. The sites were identified through a stepwise random sampling design, the number limited to a proportional representation of the seven native vegetation and three intensive management landscape elements within the study area. A capture survey was conducted in conjunction with the spring 2003 seasonal survey.

A microbat assemblage of between 14 and 17 species was identified in the study. These species were divided into Guilds based upon the ultrasound frequency used, and the frequency relationship to insect hearing. The study suggested that species in the Guild utilising the lower frequencies within insect hearing have adapted foraging patterns and used cotton fields significantly during crop production. This Guild of species recorded the highest call abundance and the most extensive spatial distribution across all landscape elements and all seasons and movement from cotton fields to vegetation remnants in autumn after crop production. However a comparison between activity associated with conventional and two gene Bollgard II GM cotton varieties suggested changes to this pattern. Impacts upon the bat assemblage due to the use of GM cotton varieties are unknown. The Guilds of species utilising higher frequencies with foraging patterns below the canopy, within vegetation and the understorey, recorded the lowest presence across the whole landscape, particularly in summer. Very few remnants within the study area contain a shrubby understorey.

Nocturnal patterns of activity varied between species and for individual species between seasons, with the season of highest call abundance varying between species. A species index showed the highest species richness occurred in spring as well as in autumn. A distribution index showed the landscape element recording the highest species richness was river gum open woodlands (14) in spring, but in autumn a species richness of 13 was recorded for the poplar box and mixed species categories. Five other landscape categories recorded 12 species, irrigated cotton and mixed species in spring, poplar box in summer, and river gum open woodland and dryland cropping in autumn. The summer absence of one species, *Tadarida australis* was most likely due to a combination of rainfall, temperature and humidity parameters. Other seasonal variations in presence could be associated with cotton insect population movement but could not be ascertained. Activity patterns for the assemblage, for individual microbat species, and for insects were examined nocturnally, seasonally and spatially, and in relation to climatic conditions.

Captured bats included a black morph *Chanilolobus gouldii*, three lactating *Chanilolobus morio*, and three *Nyctophilus* spp. *N. geoffroyi*, *N. gouldii* and *N. timoriensis.* For many areas the status of the latter species as well as three others identified in the study (*Saccolaimus flaviventris*, *Chalinolobus picatus*, *Vespadelus troughtoni*) is Vulnerable.

Microbat contribution to reductions in the cotton pest moth *Helicoverpa* spp. may be twofold, by (i) direct predation, and (ii) interruptions to nocturnal reproductive activities resulting from avoidance behaviour at the detection of microbat ultrasound echolocation. On the other hand microbat roosting site requirements, limited to tree hollows, bark and human structures in the study area, suggests that an ecosystem service is being provided to cotton production by vegetation remnants containing old trees. Although cotton landscapes still contain indigenous vegetation remnants strong incentives are required for their maintenance. The identified microbat presence and activities could provide not only a link between production and conservation, but also economic and environmental incentives for improved management practices of remnant vegetation.

The results of this study begin to provide an understanding of the complex relationships between individual species and an assemblage of microbats in an intensive agricultural landscape matrix. Many results have important management implications including for GM cotton varieties.

Objectives

1. List the project objectives and the extent to which these have been achieved.

Methods

2. Detail the methodology and justify the methodology used. Include any discoveries in methods that may benefit other related research.

Results

3. Detail and discuss the results for each objective including the statistical analysis of results.

Outcomes

4. Describe how the project's outputs will contribute to the planned outcomes identified in the project application. Describe the planned outcomes achieved to date.

5. Please describe any:-
   a) technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.);
   b) other information developed from research (eg discoveries in methodology, equipment design, etc.); and
   c) required changes to the Intellectual Property register.

Conclusion

6. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. What are the take home messages?

Extension Opportunities

7. Detail a plan for the activities or other steps that may be taken:
   (a) to further develop or to exploit the project technology.
   (b) for the future presentation and dissemination of the project outcomes.
   (c) for future research.

8. A. List the publications arising from the research project and/or a publication plan.
   (NB: Where possible, please provide a copy of any publication/s)

   B. Have you developed any online resources and what is the website address?

Part 4 – Final Report Executive Summary