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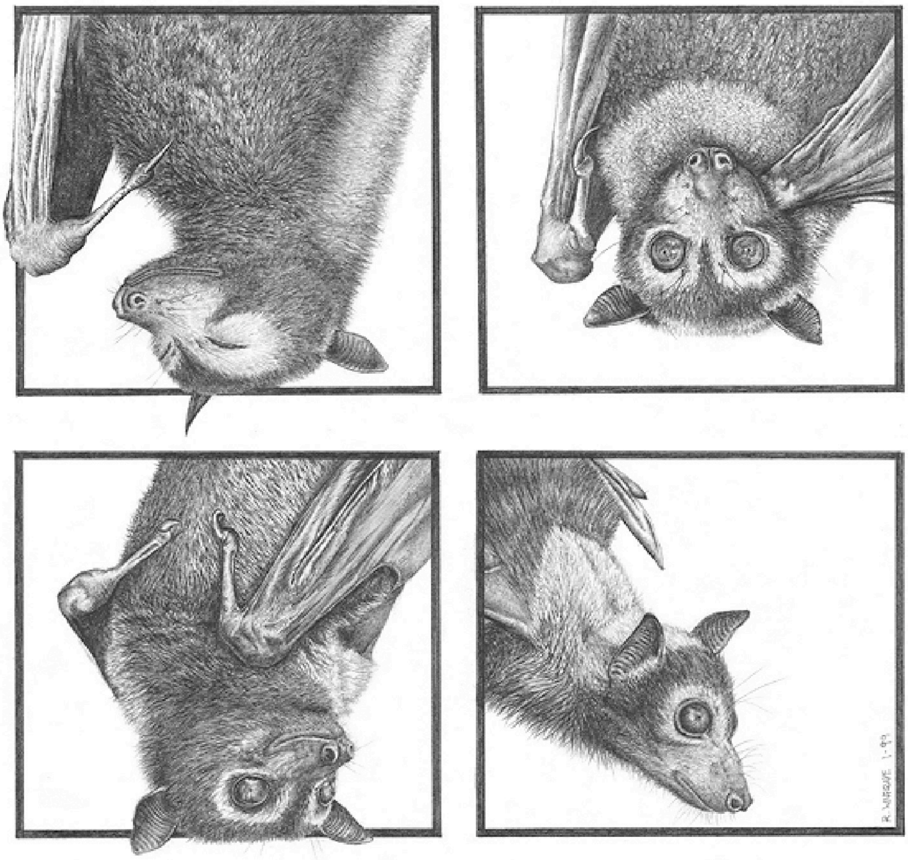
Population structure in the spectacled flying fox, *Pteropus conspicillatus*: A study of genetic and demographic factors



Artist Robin Wingrave. Used with permission

Thesis submitted by

Samantha J Fox B. Sc. Hons. (JCU)

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For the degree of Doctor of Philosophy

In the Schools of Tropical Biology, and Tropical Environment Studies and
Geography, James Cook University, Townsville

In nature's infinite book of secrecy

A little I am read

- William Shakespeare, 'Anthony and Cleopatra'

Statement of sources

DECLARATION

I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any University or other institution of tertiary education. Information derived from the published or unpublished work of others has been acknowledged in the text and a list of references given.

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Abstract

The spectacled flying fox (*Pteropus conspicillatus*) is a difficult species to manage due to its dual status as an agricultural pest and a native species under threat. Like other flying fox species, the spectacled flying fox is very mobile, roosts in colonies during the day in largely inaccessible places, and is active at night. These factors make the spectacled flying fox a difficult species to study and are in part responsible for the lack of knowledge on the biology and ecology of this species. The population structure of the spectacled flying fox was examined using two genetic markers (highly polymorphic microsatellites, and a portion of the mtDNA D-loop) and cementum layers around the root of canine teeth to determine age structure. Incorporating both genetic and demographic factors, as well as examining population structure across several temporal and spatial scales, provided a more comprehensive understanding of this species.

A new hypothesis for the origin and evolution of flying foxes in Australia is presented: that flying foxes are an old lineage in Australia and that they colonised PNG from Australia rather than the other way around. The spectacled flying fox has experienced a tumultuous history, including population expansion and contraction as a result of climatic and geographic events. These events have aided in shaping the contemporary structure of highly connected colonies within a single panmictic population in the Wet Tropics region, along with an isolated population at Iron Range and populations of unknown status in Papua New Guinea. High allelic and haplotypic diversity suggest an old lineage within Australia, and the patterns of diversity suggest colonisation from Australia to PNG. Introgression between black flying foxes and spectacled flying foxes suggests a close association of these two species. The possibility of incomplete lineage sorting also suggests that *Pteropus alecto* and *Pteropus conspicillatus* might still be in the process of diverging. *Pteropus poliocephalus* might also belong to such a species complex, although no relevant data are yet available. Although high levels of gene flow occur among colonies within the Wet Tropics region, some sub-structuring in the form of kin groups within colonies is indicated, with several cohorts of young remaining with their mothers before the young reach sexual maturity. High rates of mortality and low reproductive output may be putting this species at risk of decline, especially as their average longevity is considerably less than expected.

This study highlights the need for spectacled flying foxes to be managed on a regional scale. In addition, mortality rates need to be investigated throughout the Wet Tropics to determine the applicability of mortality rates estimated in this study, across the range of the species.

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