

IN THE PLANNING AND ENVIRONMENT COURT
AT BRISBANE

No. BD 2845 of 2006

BETWEEN: **CAROL JEANETTE BOOTH**

Applicant

AND: **RICHARD GEORGE YARDLEY**

First Respondent

ANTJE GESINA YARDLEY

Second Respondent

AFFIDAVIT

Filed on: ... November 2006

Filed by: Environmental Defenders Office (Qld) Inc

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On 10 November 2006 I, **Dr Samantha Jane Fox**, researcher at James Cook University, Townsville, Queensland, affirm:

1. I have been asked by the applicant to provide an expert opinion of the current population status of the Spectacled Flying-fox (*Pteropus conspicillatus*) in the Wet Tropics World Heritage Area of North Queensland. I have also been asked to give my opinion on the potential impacts on the Wet Tropics population of Spectacled Flying-foxes if respondents' electric grids are allowed to continue to operate after 21 November 2006 and in coming years.
2. I have been instructed in accordance with the Court's practice direction that:
 - (a) I have overriding duty to assist the Court and that I am not an advocate for a party; and
 - (b) My duty to the Court overrides any obligation I may have to any party to the proceeding or to any person who is liable for my expert fees or expenses (although I note that I am not being paid any fee to provide this report).

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Deponent

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AFFIDAVIT OF SAMANTHA
JANE FOX
Filed on behalf of the Applicant
PEC-5

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Relevant expertise

3. My formal academic qualifications are as follows:
 - (a) Bachelor of Science at James Cook University, Townsville, Queensland (1997);
 - (b) Bachelor of Science with honours (First class) in sexual selection and polymorphism in the endangered Gouldian finch (1999); and
 - (c) Doctor of Philosophy on the population structure in Spectacled Flying-foxes, using genetic and demographic techniques (2006).
4. My fields of research and professional interest include:
 - (a) Evolution and hybridization of flying-foxes in Australia
 - (b) Conservation through education and involvement of the community.
 - (c) The evolution of demographic and life history characteristics.
 - (d) Reducing human impact on environmental systems.
 - (e) Wildlife Ecology, especially within the Wet Tropics region of north Queensland.

Flying-fox classification, biology and ecology

5. I have read and I agree with the summary of flying-fox biology, ecology and morphology provided by Dr Booth at paragraphs 28-36 her affidavit affirmed on 22 September 2006. I note in particular my agreement with Dr Booth and Dr Spencer, that flying-foxes are vital for maintaining ecological processes in tropical to temperate forests through their role in pollination and seed dispersal of many species of flowering plants. In many places, flying-foxes are the only large mammal capable of dispersing large seeds, with some native plant species relying on their dispersal abilities alone. Flying-foxes, therefore, fulfill a vital role that is essential for maintaining the ecological health of native forests.
6. As flying-foxes fulfill an important ecological function in pollination and seed dispersal of many plant species, a decline in flying-fox numbers is likely to impact on plant species that are pollinated and dispersed by flying-foxes.
7. Some aspects of the ecological function of flying-foxes in seed dispersal are complex and dependent on competitive interactions that are directly dependent on flying-fox densities and may not generally occur beneath certain densities. Flying-foxes disperse small seeds through swallowing the seeds and flying some distance before depositing the seeds through defecation. However, large seeds are not swallowed and dispersal of seeds away from the parent tree requires that a flying-fox fly elsewhere carrying the fruit to eat it and spit out or drop the seeds. This typically occurs only when a flying-fox is chased away from the parent tree by another flying-fox defending the food

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source. Therefore seed dispersal of larger seeds (bigger than about 4 mm) requires there to be sufficient numbers of flying-foxes for such competitive interactions to occur in a feeding tree.

8. For these reasons, if flying-fox numbers fall below the densities required for competition for food sources they may not fulfill their ecological function in dispersal of large seeded plants. If this occurs flying-foxes become “functionally extinct” as seed dispersers, even though the numbers of flying-foxes in a population may mean the flying-foxes themselves are not threatened with extinction. This is explained and demonstrated in a scientific paper “Flying Foxes Cease to Function as Seed Dispersers Long Before They Become Rare” by Kim McConkey and Donald Drake, published in the peer-reviewed journal *Ecology*, exhibited as “SJJF-1”.
9. Spectacled Flying-foxes are closely associated with the rainforests of the Wet Tropics World Heritage Area and are regarded as particularly important in pollination and seed dispersal for many plant species within this area of high conservation value.

Population status of the Spectacled Flying-fox

10. The population of Spectacled Flying-foxes in the Wet Tropics World Heritage Area is difficult to estimate precisely but considerable work has been done using “fly out counts” to estimate the population size. The most recent estimate of Spectacled Flying-foxes in the Wet Tropics region, which was counted in December 2005, is 296,728 (Freeman 2006), exhibited as “SJJF-2”. This is a large increase on the 2003 estimate of 172,750, the last reliable count (there were problems with the 2004 count which has therefore not been published). Due to the low reproductive output of this species it is impossible that this increase has occurred as a result of reproduction. It is most likely that this increase in numbers is a result of animals moving into known colonies that are counted annually, from unknown colonies that are not counted. It is recognized that there are likely to be Spectacled Flying-fox colonies within the rainforest areas of the Wet Tropics World Heritage region which are not known. The inability to count all existing colonies is the single biggest problem with this methodology.

Population structure of the Spectacled Flying-fox

11. In the science of ecology, the population structure of a species is the geographic distribution, genetic variation and demographic change of animal and plant populations through time. During the research for my PhD I studied the population structure in Spectacled Flying-foxes using genetic and demographic techniques.
12. Life history characteristics, such as age to sexual maturity, life expectancy, and number of young produced per year, are used to understand changes in population structure and distribution over time. Life history characteristics in mammal species fall along a ‘fast-slow’ continuum. Small species, such as mice, typically have early sexual maturation, high reproductive output, and a short life span. These can be called ‘fast’ species as they are fast to reproduce and small populations may recover quickly from major population reductions. Larger mammal species, such as humans, typically have

late sexual maturation, low reproductive output and a longer life span. These can be called 'slow' species because they are slow to reproduce and the size of their populations is generally quite stable. Bats (including flying-foxes) are considered to be 'slow' species. Flying-foxes have been known to live longer than 30 years in captivity and so the expectation was that they would also live long lives in the wild.

13. Spectacled Flying-foxes are known to give birth to a single young between the months of September to December. From captive animals, we know that although females are capable of giving birth at the age of 2 years, most do not give birth until 3 years. My Doctoral study found that only 33% of two year olds reproduce and that 79% of 3 year olds reproduce. It was not until the females reached 4 years of age that the majority were reproducing. Additionally, it was shown that only 89% of sexually mature females reproduce each year.
14. Flying-foxes forage at night and roost during the day in colonies (known as "camps"). The population of Spectacled Flying-foxes in the Wet Tropics World Heritage Area is distributed across many colonies ranging from several hundred to several thousand individuals. Flying-foxes may fly up to 50km per night so they may forage a considerable distance from their colony or migrate to another colony. During my Doctoral research I studied the Tolga Scrub colony of Spectacled Flying-foxes on the Atherton Tablelands, which is approximately 50km from the respondents' farm.
15. My study found that Spectacled Flying-foxes from the Tolga Scrub colony were not living as long as expected. Of 360 animals aged, 96% were 6 years of age or less. Two females aged 13 years were found to be lactating, indicating that animals in these older age groups are still capable of reproducing and have not yet reached an age of senescence. This highlights the fact that animals in this species are capable physiologically of living to the older age groups, even though they are not.
16. Life tables created from the age data on the 360 Spectacled Flying-foxes from the Tolga Scrub colony showed that in 2001 and 2002 this colony experienced a negative growth of 16%. This particular colony suffers from tick paralysis every year at the same time as females are giving birth. The rate of loss of animals to tick paralysis is highly variable from year to year, but in a bad year it is estimated that 5% of a colony can be lost. The Tolga Scrub colony in those years supported approximately 5-6,000 animals (data from the annual census) and both years were known to be bad tick paralysis years. The negative growth rate experienced by the colony in these years was shown to be affected by tick paralysis, but when the effect of tick paralysis was removed (the difference between instantaneous mortality and annual mortality) there was still a significant negative growth rate of 12%.
17. Flying-foxes suffer from a number of threats including: barbed wire fences; power lines; predation from sea eagles, pythons and goannas; loss of native habitat for roosting and food; conflict with the public; culling in orchards by fruit farmers; and tick paralysis. Unfortunately there is little information as to the contribution of each threat to the total mortality rate.

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- 18. The low reproductive output (1 young per year and not every year), the late age of sexual maturation (3-4 years) and the fact that the majority of animals do not live past 6 years of age, means there is a small window of opportunity for females to reproduce. These figures suggest that it would be difficult for this population to increase in number and a high mortality rate will result in a negative growth rate.
- 19. The genetic side of my Doctoral study showed that there is movement between colonies of Spectacled Flying-foxes within the Wet Tropics region. This is consistent with work carried out by the CSIRO using radio and satellite telemetry. This movement is likely to homogenize any population reduction so that it is not immediately obvious to people working with the species. It must be emphasized here, however, that the life tables and growth rate calculated in my study concentrated on a single colony and there is no data on other colonies to verify whether this is a consistent pattern in other colonies throughout the region, or whether 2001 and 2002 were anomalous years and other years show different patterns.
- 20. The period when fruit farmers are usually active in their control of flying-foxes in their orchards coincides with the time when females are carrying dependant young. It is likely, therefore, that the loss of a female on electrocution grids would also result in the loss of her young. This fact compounds the negative effects of culling in fruit orchards on the population structure of flying-foxes.

The respondents’ land and electric grids

- 21. I understand that the respondents’ property is located at Hosking Road, Mirriwinni, being land described a Lot 1 on RP 712412, County of Nares, Parish of Bellenden Ker, in the State of Queensland (“**the land**”). The land is immediately adjacent to part of the Wet Tropics World Heritage Area.
- 22. I have not visited the land but I have worked extensively in the Wet Tropics region and am familiar with the general area. I am also familiar with the distribution of Spectacled Flying-foxes in the Wet Tropics World Heritage Area.
- 23. I have been provided with a copy of the affidavit of Dr Carol Booth affirmed on 22 September 2006 and the affidavit of Dr Hugh Spencer affirmed on 24 October 2006. I understand from the statements made by the first respondent in a radio interview in early 2006, set out in the affidavit of Dr Booth, that the number of flying-foxes killed by the electric grids may vary considerably from year to year but may be in the order of 400-700 animals killed per year. I also note my agreement with Dr Booth that, given the location of the land, the most likely species to have been killed by the respondents’ electric grids are Spectacled Flying-foxes.

Likely impacts of respondents’ electric grids on the Spectacled Flying-fox population

- 24. In my opinion, based on the most recent estimate of 296,728 Spectacled Flying-foxes in the Wet Tropics region, and their population ecology, the likely impacts of the respondents electric grids are to create extra mortality pressure on populations that

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appear to already be under an unsustainable amount of mortality pressure. As a comparison, in a bad tick paralysis year approximately 5% of the population will be lost to tick paralysis. These numbers are based on the Tolga Scrub colony, which in the years 2001-2003 had approximately 5000-6000 flying-foxes. Five percent of this number would be 250-300 flying foxes. The loss of this number of bats created an increase in the negative growth of 4%. If the respondent's grids are removing more than double this number of animals, it is likely that the loss to a population would be significant. These figures are based solely on the loss of adult flying-foxes and do not take into account the likely loss of dependent young attached to their mothers. Therefore, any estimated loss is likely to be underestimate. If the mortality pressure placed on the Spectacled Flying-fox is constantly high as found in my Doctoral study, this species will decline.

25. I believe that the Wet Tropics population of Spectacled Flying-fox is already in decline and that the additional mortality imposed by the respondents electric grids, if continued in the future, will contribute significantly to the population continuing to decline in numbers and prevent the population from recovering. This is likely to have far reaching effects on the future sustainability of the unique rainforests of the Wet Tropics World Heritage Area.

Declaration

26. The factual matters stated in this report are true, to the best of my knowledge except as stated otherwise. I have made all enquires considered appropriate in review of this matter. The opinions stated in the report are genuinely held by me, and I have referenced all matters I consider to be significant. I understand my duty to the Court and believe I have complied with this duty to the best of my ability. To the best of my knowledge there are no readily ascertainable additional facts that would assist me in reaching more reliable conclusions.

Affirmed by Samantha Jane Fox)
at this)
10th day of November 2006)
Before me:)

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Deponent

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AND: **RICHARD GEORGE YARDLEY**

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CERTIFICATE OF EXHIBIT

This and the following pages are Exhibit SJF-1 to the affidavit of Dr Samantha Jane Fox affirmed 10 November 2006.

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Deponent

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Justice of the Peace / Solicitor

CERTIFICATE OF EXHIBIT TO
THE AFFIDAVIT OF
SAMANTHA JANE FOX
Filed on behalf of the Applicant

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CERTIFICATE OF EXHIBIT

This and the following pages are Exhibit SJF-2 to the affidavit of Dr Samantha Jane Fox affirmed 10 November 2006.

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CERTIFICATE OF EXHIBIT TO
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SAMANTHA JANE FOX
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