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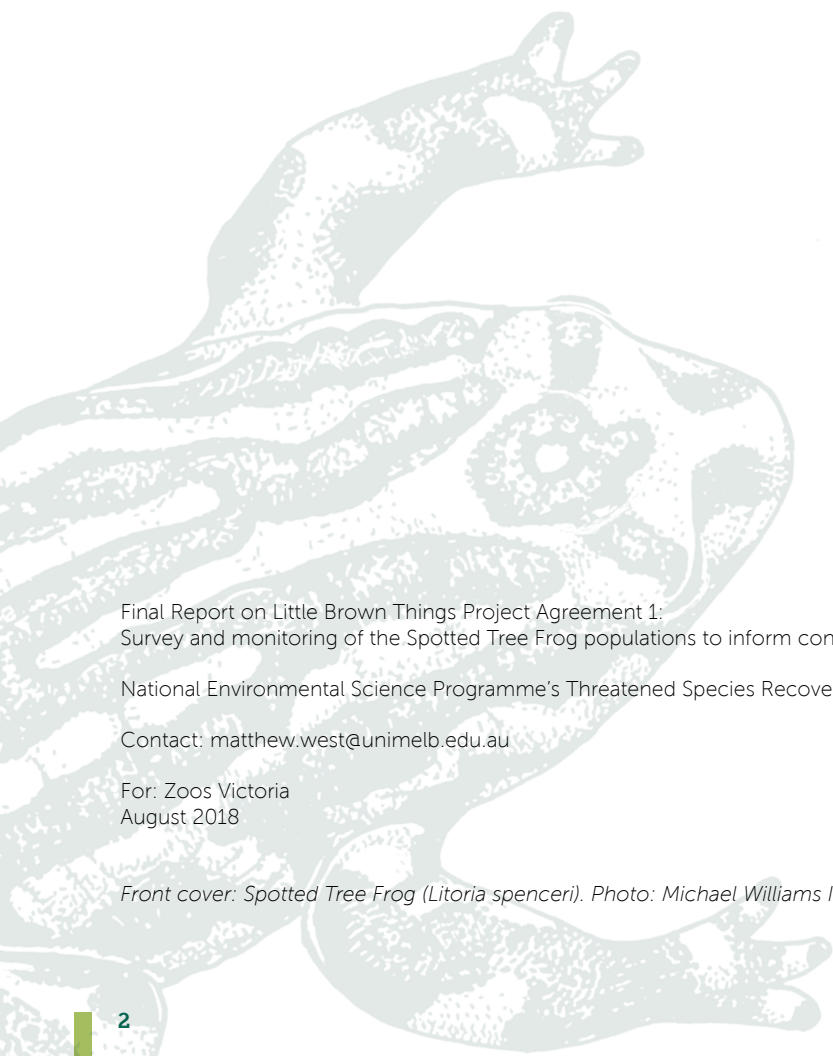
National Environmental Science Programme



Survey and monitoring of the Spotted Tree Frog populations to inform conservation actions

Final Report on Little Brown Things Project Agreement 1

9 August 2018



Final Report on Little Brown Things Project Agreement 1:
Survey and monitoring of the Spotted Tree Frog populations to inform conservation actions.

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For: Zoos Victoria
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Front cover: Spotted Tree Frog (Litoria spenceri). Photo: Michael Williams It's a Wildlife

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A spotted tree frog (Litoria spenceri). Photo: Michael Williams, It's a Wildlife Photography

Background

The Spotted Tree Frog, is a priority species under Zoos Victoria's Fighting Extinction campaign. The species has already disappeared from 50% of known historic sites, is rare at all remaining sites and is predicted to continue to decline without intervention (West 2015). Currently Spotted Tree Frogs are listed as critically endangered in Victoria (DSE 2013) and endangered nationally under the EPBC Act 1999. Funding was recently secured by Zoos Victoria under a Little Brown Things Project to support Spotted Tree Frog recovery efforts.

Proposed management interventions for Spotted Tree Frogs include identifying and creating safe-havens for frogs from key threatening processes: non-native fish predation and disease caused by chytrid fungus. Extensive surveying and monitoring for this species has occurred since the early 1990's (Gillespie & Hollis 1996; West 2015). This work has been crucial for threat identification and can now be used to understand of the species population trajectory. Furthermore, the monitoring program is crucial for the evaluation of proposed management interventions.

Zoos Victoria engaged the University of Melbourne to deliver Conservation Action 2 for the Spotted Tree Frog Little Brown Things Project:

Survey and monitoring of the Spotted Tree Frog populations to inform conservation actions.

The specific objectives of this project were to:

1. Carry out seasonal population monitoring at key long-term mark-recapture monitoring sites between November and April until 2018
2. To determine population trends sufficient to identify triggers for management intervention, such as the need for captive intervention.



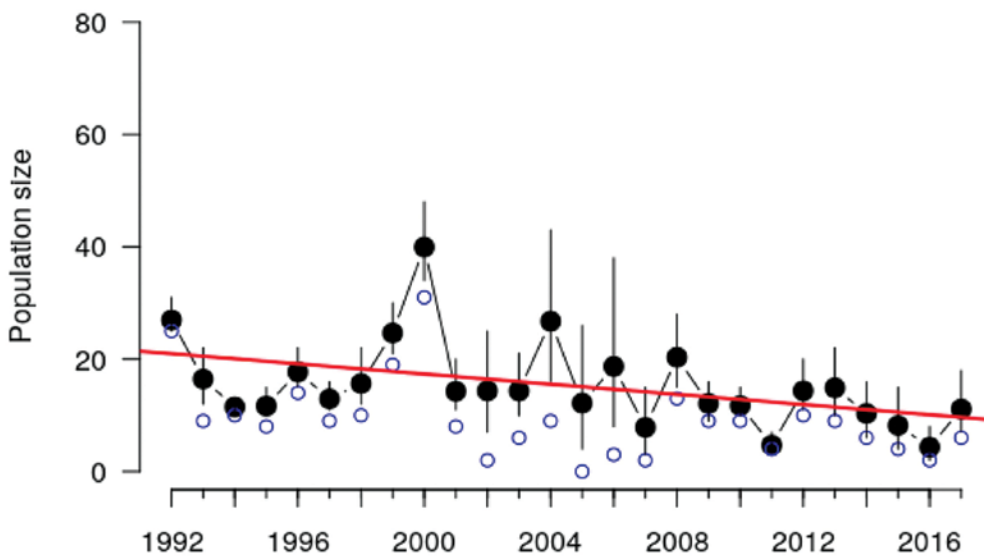
Dr Matt West at a spotted tree frog survey site. Photo: Michael Williams, It's a Wildlife Photography

Summary of Methods

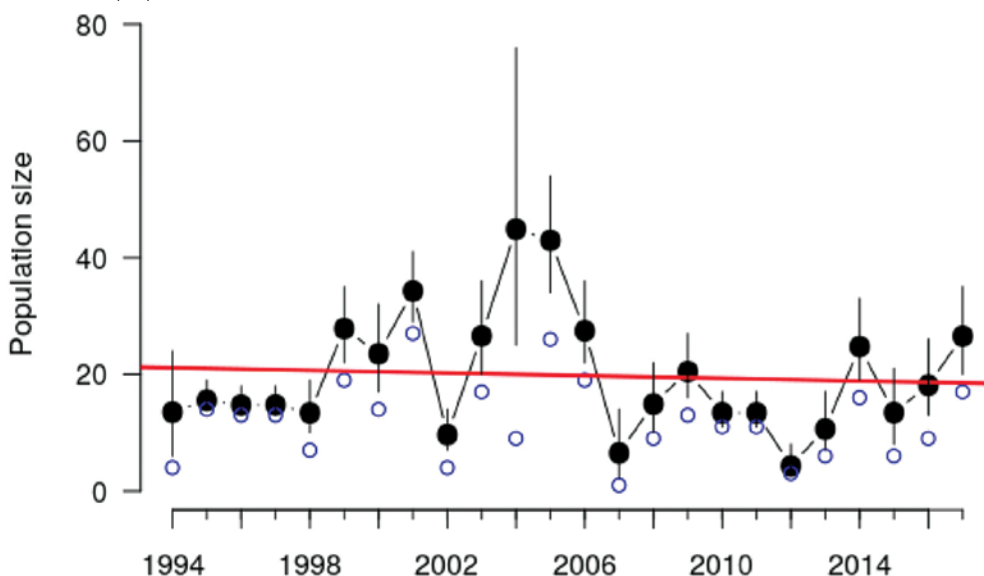
The following activities were undertaken:

1. Mark-recapture surveys for Spotted Tree Frogs were conducted at two key long-term monitoring sites (here after referred to as Site 1 and 2) in north-eastern Victoria over two seasons (November 2016 – April 2017 and November 2017 – April 2018).
2. All captured frogs were marked and swabbed and released the site of capture.
3. Collected swabs were submitted for chytrid analysis.
4. Spotted Tree Frog population trends at the two sites we assessed using a Bayesian formulation of Pollock's Robust Design mark-recapture model. The approach permitted population size, population growth rates, annual survival probability, and detection probabilities to be estimated. Analysis focussed on data collected at the long-term 200m transects which have been monitored for the last 24-26 years. Monitoring started in 1992 at Site 1 and 1994 Site 2. A total of 262 surveys have been conducted at Site 1 and 219 surveys at Site 2. The analysis accounted for differences in detection of frogs during day surveys compared to night surveys.

Key Results



Figures 1. Population changes at the Site 1 200m transect from 1992 to 2017. Each year represents a survey season between November of that year and April the following year. Blue circles indicate the number of adult frogs encountered in each survey season. Black circles indicate the mean estimated adult population size in each survey season. Vertical bars indicate the 95% credible interval for each population estimate. The actual distance over which the population size was estimated was a 220m, includes 10m above and below the 200m transect.



Figures 2. Population changes at the Site 2 200m transect from 1994 to 2017. For further explanation of the figure see Figure 1.

Discussion

Analysis of the long-term mark recapture data collected at Sites 1 and 2 indicates that a relatively small population of adult Spotted Tree Frogs have persisted at both sites throughout the study period (24 and 26 years). Currently more adult Spotted Tree Frogs occur at the Site 2 transect (mean 26; 95%CI: 20- 35) than at the Site 1 transect (mean 11; 95%CI: 7- 18). However, the adult frog population sizes have varied across the study period (Figs. 1 and 2). At times the populations have dropped becoming very small and may have reached as few as 2 individuals at each site (in 2007 and 2012 at Site 2 and in 2016 at Site 1). The population at Site 2 has been particularly variable since the late 1990's with a mean of 19 adults and ranging between mean estimated population sizes of 4 and 40 adults. The Site 1 population has ranging between mean estimated population sizes of 4 and 43 adults. The Site 1 population was most variable from 1992-2009 with an average of 18 adults. Although more recently (since around 2010) the Site 1 population appears to have been less variable and with a lower mean population size around 10 adults. These changes in each population are also reflected in the estimated population growth rates for each site; mean Site 2 pop. growth rate is 1.25 (sd: 0.73), mean Site 1 pop. growth rate is 1.15 (sd: 0.73). At times the population growth rates have been very low: 0.24 at Site 2 and 0.36 at Site 1. In summary the results indicate that the populations of Spotted Tree Frogs at both sites are small and at times reach very low numbers of adults. The trend of decline at Site 1 (shown by a redline in Fig. 2) is particularly concerning. This suggests the populations are vulnerable to further decline and extinction due to processes that reduce adult survival or recruitment including non-native fish and chytrid fungus.

Non-native Brown Trout, Rainbow Trout, Carp and Redfin have all been encountered at the sites during the study period. The trout species are most commonly observed and have been present throughout the entire monitoring period at both sites. Currently insufficient data is available on the relative abundance of the non-native fish at sites. Consequently, the degree to which the non-native fish influence frog population dynamics cannot yet be ascertained. Non-native fish are known to predate upon Spotted Tree Frog tadpoles (Gillespie 2001) and are expected to reduce Spotted Tree Frog recruitment and population sizes at both sites. Although their influence through predation on tadpoles could either be a constant effect or it may be more variable. Previous work indicates that Spotted Tree Frog populations are most sensitive to processes that influence survival of eggs – year 1 life stages (West 2015). Therefore, any predation of tadpoles by non-native fish is likely to reduce the frog population sizes at sites.

Chytrid fungus was first detected at Site 1 and Site 2 sites in 1997, although the pathogen may have been present since the mid-late 1970's (approximate period of arrival in Australia). Chytrid infected frogs continue to be detected at both Site 1 and Site 2 including during the 2016/2017 and 2017/2018 survey seasons conducted as a part of this project. Earlier analysis by West (2015) demonstrates the chytrid infection reduces the survival of adult frogs. Therefore, in addition to the impacts of non-native fish, chytrid is also likely to be continuing to reduce the survival of adults and suppressing the population sizes at both sites.

The basic model developed during this project can now be used to further evaluate the relative influence of the two main threats, environmental factors and stochastic events upon the Spotted Tree Frog populations. This will be important for disentangling the relative effects of threats from the natural processes that can also influence population fluctuations. Variation in rainfall and ambient temperatures throughout the frog's active season could influence things like frog breeding success, growth rates and survival; disease prevalence and progression; and non-native fish density and predation rates at sites. Populations are also expected to have responded to bushfire and drought events. Further analysis is therefore required and will be a focus of future work. Much of the required environment, climate and chytrid data has already been compiled. Data on non-native fish is trickier to obtain, but some of this is currently being collected as part of the 2nd Little Brown Things agreement for Spotted Tree Frogs and will be useful for the next stages of analysis.

The Spotted Tree Frog population size estimates and trajectories presented in this report can now be used as a baseline from which to assess future population changes under proposed management activities. Chytrid cannot yet be eliminated from these sites but non-native fish management is technically feasible. However, Brown and Rainbow Trout are both highly valued by recreational fishers, and actions to remove trout from sites have not previously been supported by the community. Recently representatives from recreational fishing groups – the members of the Spotted Tree Frog Recreational Fishers Advisory Committee have agreed to work with us to consider options for non-native fish management at Site 1. Notably the Recreational Fishers have indicated that they will prepare a proposal for non-native fish management at Site 1 that will be used for garnering support and communicating the idea with key Recreational Fishing Group boards, committees and the broader community.

References

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- West, M. (2015) Contrasting population responses of ecologically-similar sympatric species to multiple threatening processes PhD, The University of Melbourne.



A female spotted tree frog (*Litoria spenceri*). Photo: Matt West

Further information:

<http://www.nespthreatenedspecies.edu.au/>

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