



University of  
**BRISTOL**



**Bristol Zoological  
Society**  
Saving Wildlife Together

THE *Alice*  
McCOSH  
TRUST



# PROJECT REPORT

## SEPTEMBER 2021

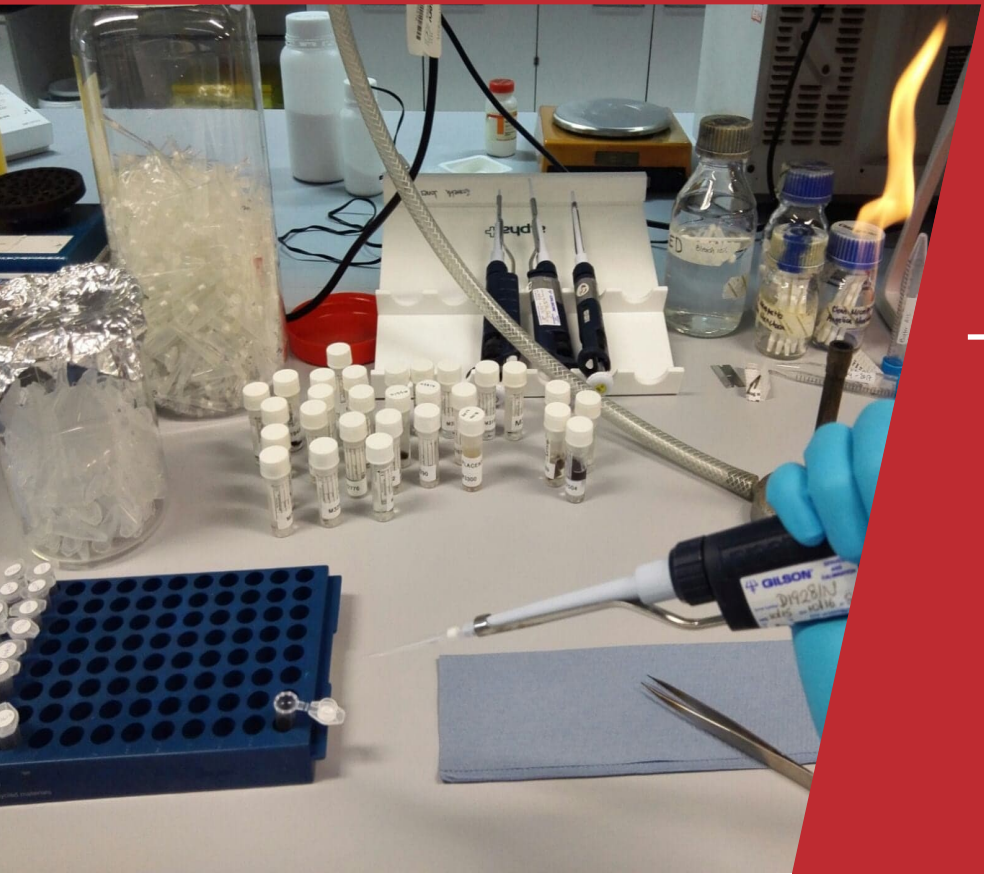
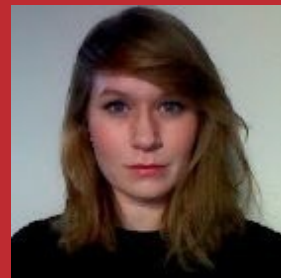
Creating a genetic pedigree in captive Livingstone's  
fruit bats (*Pteropus livingstonii*)

**Sarah Richdon, PhD student**

sarah.richdon@bristol.ac.uk 

srichdon.wixsite.com/batonthebrink 

@SarahRichdon 



# Creating a genetic pedigree in captive Livingstone's fruit bats (*Pteropus livingstonii*)

A University of Bristol PhD project, in association with Bristol Zoological Society & Jersey Zoo, supported by the Alice McCosh Trust and Experiment.com crowdfund campaign.

## Background

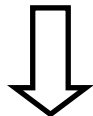
Livingstone's fruit bats are Critically Endangered (IUCN 2018), found only on the Comoros islands (see Figure 1) and are thought to be one of the rarest bats in the world. Due to declining population numbers, from human-driven deforestation and sporadic tropical cyclones (Mickleburgh et al. 1992), ten male and two female Livingstone's fruit bats were relocated to Jersey Zoo, British Isles, in 1992 to create a captive breeding programme as a safeguard from extinction (Young et al. 1993). In 1998, two males and five females from the Jersey Zoo population were moved to Bristol Zoo Gardens, UK to create two reproductively isolated groups. Within the captive breeding programme, there are now 68 Livingstone's fruit bats but, as paternity is often cryptic (many males may mate with the same female and it is uncertain who the father is), little is known about the genetic health of these populations.

My work has unravelled the genetic framework of captive Livingstone's fruit bats, identifying who is reproducing by creating a family tree (genetic pedigree) and allowing conservationists to make better informed decisions on future breeding to ensure the genetic health of the species is maintained.

As a self-funded student, the large expenses associated with molecular work of this type would have been prohibitive for me, meaning this vitally important project would not be accessible and would likely never occur. Through crowdfunding ([experiment.com/batonthebrink](http://experiment.com/batonthebrink)) and the kind grant award from the Alice McCosh Trust, I managed to raise enough money to take on this work, for which I am very grateful.

## Process

Extract DNA  
from wing tissue  
biopsies



- ⇒ Wing tissue samples have been collected by the vet departments of Jersey and Bristol Zoo during routine health checks, since 2012.
- ⇒ DNA extraction from tissue involves digesting tissue with enzymes and washing off unrequired components until only pure DNA remains.

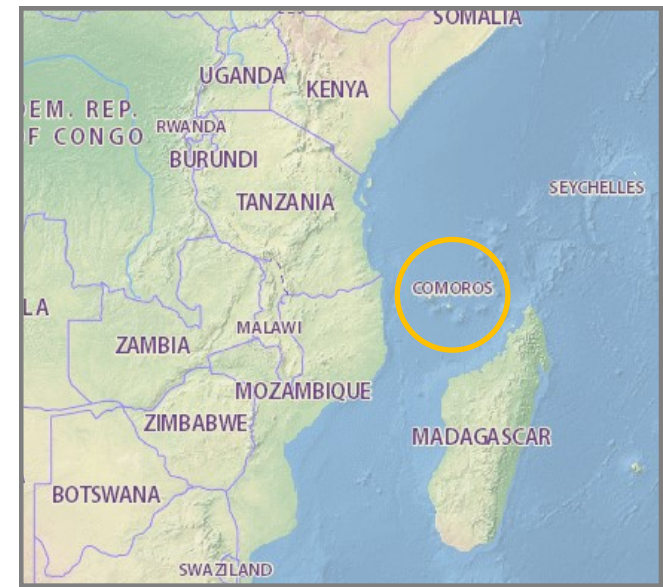


Figure 1 - Position of the Comoros islands, relative to Madagascar and Central Africa, the native home of Livingstone's fruit bats

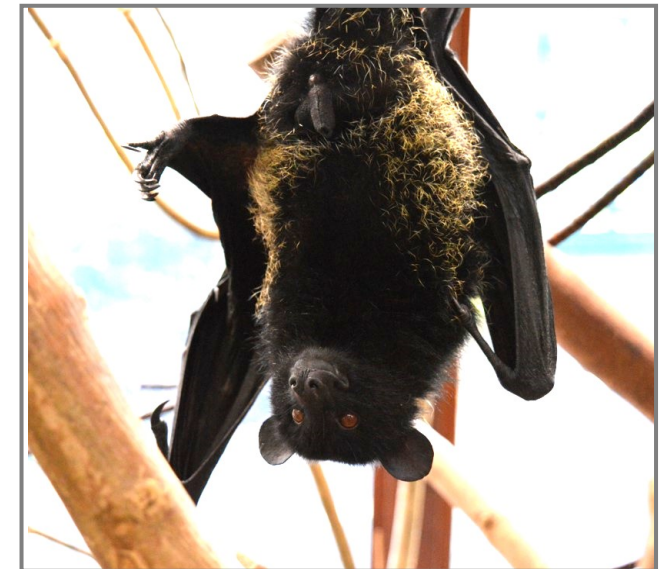


Figure 2 - Rasputin, the Livingstone's fruit bat, enjoying the sun at Bristol Zoo Gardens

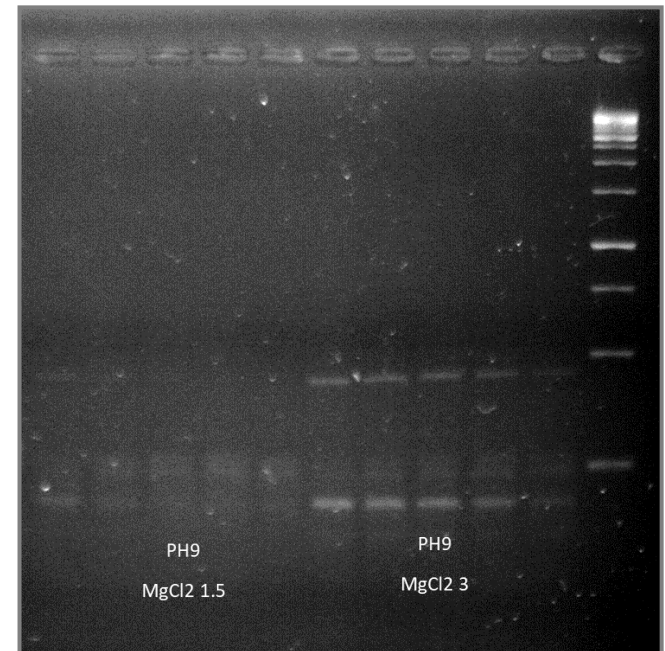
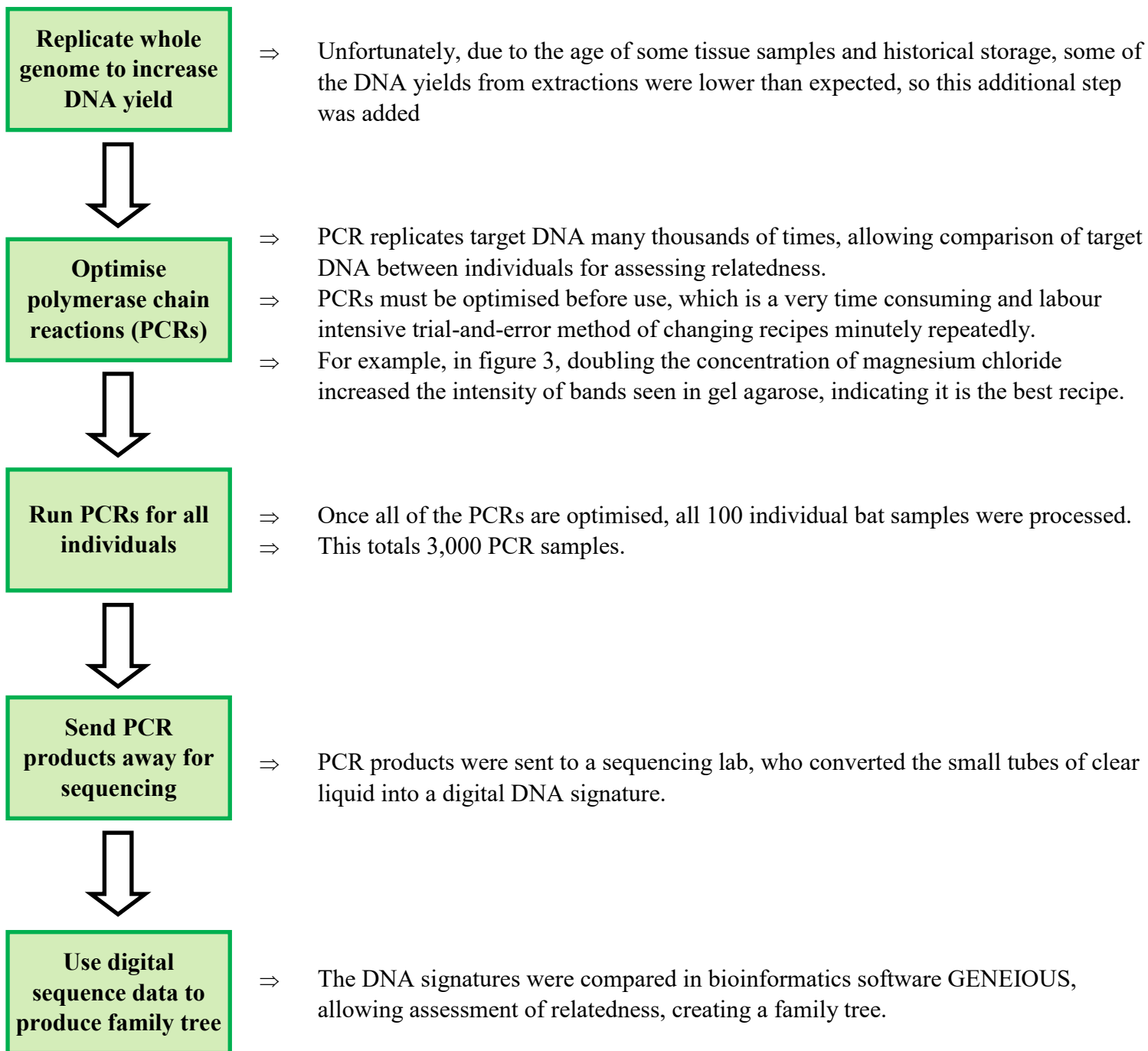


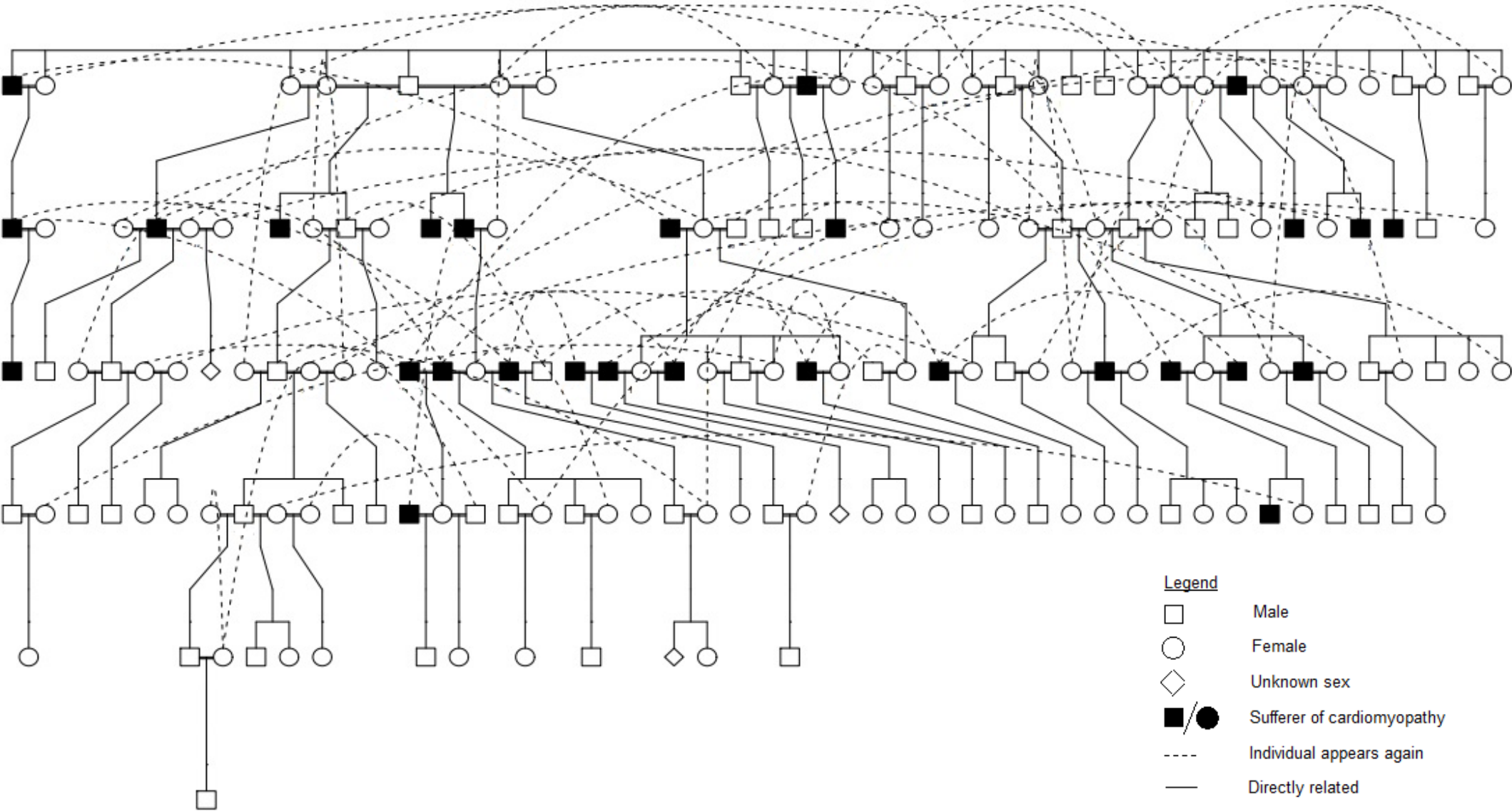
Figure 3 - Gel electrophoresis photo showing optimisation of primer PH9 with manipulation of MgCl<sub>2</sub> levels (the clearer/brighter the bands the better)

Table 1 - Overall cost breakdown of project, with Alice McCosh grant contribution in green

PCRs	£4,900
DNA sequencing	£4,100
DNA extractions	£400
Lab consumables	£600
<b>Total</b>	<b>£10,000</b>

Genetic pedigree (family tree)

This confusing diagram shows the family tree of all bats included in this research, and its production was the main aim of this study. Names of the bats have been removed as this work is not yet published, however it shows relatedness of offspring and whether cardiomyopathy is hereditary.



## Result implications

Genetic diversity remains comparable to the wild

Fathers of offspring can be allocated meaning translocations of bats in captivity is now better informed

It appears that there may be a genetic component of heart disease in captive bats.

## Acknowledgements

This project is part of a self-funded University of Bristol PhD, in association with Bristol Zoo Gardens and Jersey Zoo, supported by the Alice McCosh Trust and crowdfunding through Experiment.com. As mentioned previously, this work would not have been possible without the kind support of the Alice McCosh Trust, for which I am very grateful to have received and proud to be affiliated with.

## References

IUCN, 2017. *Pteropus livingstonii* (Comoro Black Flying Fox, Livingstone's Flying Fox, Livingstone's Fruit Bat). Available at: <http://www.iucnredlist.org/details/18732/0>.

Jan, C. et al., 2012. Development of conserved microsatellite markers of high cross-species utility in bat species (Vespertilionidae, Chiroptera, Mammalia). *Molecular Ecology Resources*. 12(3), pp.532-548.

Mickleburgh, S.P., Hutson, A.M. & Racey, P.A., 1992. Old world fruit bats: an action plan for their conservation. IUCN Species Survival Commission: A Global Network for Species Survival.

Young, J.A. et al., 1993. Establishing a captive breeding programme for the endangered Livingstone's fruit bat (*Pteropus livingstonii*): The 1993 capture expedition. *Dodo: Journal of the Wildlife Preservation Trusts*. 29, pp. 22-33



Figure 4 - Claudia and baby Ben at Jersey Zoo