

## The Rufford Small Grants Foundation

### Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to [jane@rufford.org](mailto:jane@rufford.org).

Thank you for your help.

**Josh Cole**

**Grants Director**

#### Grant Recipient Details

<b>Your name</b>	Khyne U Mar
<b>Project title</b>	Maternal investment in captive Asian elephants of Myanmar
<b>RSG reference</b>	RSG 07 05 03
<b>Reporting period</b>	2004-2006
<b>Amount of grant</b>	£ 5000.00
<b>Your email address</b>	<a href="mailto:khyne_umar@hotmail.com">khyne_umar@hotmail.com</a> or <a href="mailto:k.mar@sheffield.ac.uk">k.mar@sheffield.ac.uk</a>
<b>Date of this report</b>	March,2009

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
<p>To quantify the causes and survival differences of calves born to wild-caught and captive-born elephant mothers in Myanmar</p>			X	<p>My success at meeting the objective was excellent. In my previous Rufford Small grant, I reported that wild-caught females showed lower fitness than those born in captivity. Age- and sex-specific survivorship of calves born to captive-born and wild caught mothers were not significantly different. Although the original database contains 8000+ elephants, these studies was based on 5000+ elephant records because of missing information on birth origins and dates of births/deaths/capture.</p> <p>With this continued grant, I was able to obtain more than 3000 calving records with updated information on causes of death and was able to elaborate the previous results. Over a quarter of calves born alive died before they reached their fifth birthday. In calves born alive, 10% died before their first birthday, and 27% died before their fifth birthday.</p> <p>Calves from wild-caught mothers had 30% higher mortality rate than those from captive-born mothers, while male calves had 19% higher mortality rate than females.</p> <p>Deaths due to agalactia (lack of or deficient milk formation) in mothers ranked the highest (22.52%), followed by snake bite (16.43%) and accidents (such as falling a from cliff, drowning, attack by tiger and wild elephants, and strangulation by its own chain) (16.13%). The first year mortality is 8.3% of total live births (excluding still births) in which mother agalactia is responsible for half of these deaths.</p> <p>Among the second year deaths, snake bite and accidents (falls, drowning, hit by a train and wild elephant attack) are the most common causes. Deaths decline between the ages of 3 years (2.4%) and 4 years (1.3%) but increase to 5% at the age of 5 years.</p> <p>Taming-related stress and trauma cause the highest mortality in calves between 4 years and 5 years. It can be predicted that psychological and</p>

				<p>physical trauma sustained during taming procedure is often costly, and incurs extra metabolic cost that might reduce an animal's fitness, resulting frailty, disease and finally death. Malnutrition and parasitism contribute substantially to the effect and worsen the fitness in calves at the age of taming/breaking. The other causes of deaths are parasitism, diseases and accidents.</p> <p>There is a seasonal variation of calf mortality. In all season, primiparous deaths outnumber multiparous calves. Primiparous calves are susceptible to extreme climate with peaks of death during hot (April and May) and cold (October to December) months, while the peak of deaths of multiparous calves is in January. These results are partly published in <i>Science</i> and further publications are currently being prepared.</p>
Age-specific fecundity and maternal investment			X	<p>I found that age-specific fecundity of wild-caught mothers is significantly lower than that of captive-born mothers, as the former females showed longer inter-birth intervals. Peaked age-specific fecundity (<math>m_x</math>) is at age of 22 and 25 years in captive-born and wild-caught females, respectively. I am currently preparing a manuscript of these results to be submitted to <i>Nature</i>.</p> <p>Birth sex ratio shows no significant difference between birth orders, between captive-born and wild-caught females or between mothers' ages.</p>
Inter-generational differences in calves born in captivity			X	<p>The studbook data contains 3000+ calving records born between 1950 and 1999 which can trace life history of three consecutive generations of calves born in captivity.</p> <p>In this study, I have shown that the stress of capture in first-generation (wild-caught) elephants causes reductions in survival and fecundity, and that these reduction can be detected up to 7 (for survival) or 12 (for fecundity) years after capture. Second generation elephants also suffer from reduced survival as calves but this impact does not last into adulthood. However, there is some evidence that third-generation elephants are better adapted to captivity than their ancestors in terms of reproduction.</p> <p>Third-generation mothers have the youngest average age at first birth among the three generations, and their fecundity is also slightly</p>

				higher. Overall, these results highlight the long-term negative effects of capture from the wild on long-lived animals such as the elephants so that the range states of South-east Asian countries where elephants are traditionally used for mankind should be aware that a controlled captive breeding programme to meet the carrying capacity of the foraging area will be the answer for long-term survival of captive Asian elephants.
Mate choice in Asian elephants	X			I could not manage to explore in detail due to lack of usable data in my studbook as for 30% of total elephants there are missing data on important information on parentage, and birth/death data, which we are unable to obtain from Myanmar.

**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).**

This project proceeded well as planned before and most scientific aims were met. During the twenty-four months of my grant period, I could not update the studbook data. No new information on elephants born, died and captured after 1999 was added. This was due to the lack of leadership to continue the studbook project, as I was on study leave and out of the country, and partly due to understaffing and a lack of resources at Myanma Timber Enterprise (MTE). I aim to return to Myanmar in early 2010 to train local service personnel. I also have plans to secure funding to equip my colleagues in the work force with laptop computers to allow data collection in the field. It would be greatly beneficial if more detailed information on tuskness, body mass/weight/height, reproductive status such as musth, pregnancy, barren, pregnancy outcome, paternity information and workload can be collected to understand stress, seasonal- and phenotypic-related influences on elephant biology, psychology and physiology.

**3. Briefly describe the three most important outcomes of your project.**

The three major outcomes of my project are:

- (1) Nutritional factors play an important role in the reduced survivorship among older calves, aged around 5 years.
- (2) Faster growth in males has acted on mothers to invest more resources in male offspring compared to female offspring
- (3) The mothers' birth origin influences the inter-birth interval, with longer intervals in wild-caught than in captive-born females, indicating that reproductive fitness is lower in wild-caught elephant females than captive-born females.

Based on these outcomes, I would like to recommend:

- (1) Myanma Timber Enterprise (MTE) must arrange to provide supplementary feedings and to adjust workload to females at the reproductively active age (15-25 years) .

- (2) MTE must set up nursing camps so that pregnant mothers (especially wild-caught females, with stressful early life in captivity) have full veterinary support.
- (3) It is of utmost importance to update the current studbook to add detail information on biometrics, phenotype and workload of individual animals and geographical and meteorological data of logging regions.

**4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).**

My project has indirectly benefitted mahout families and communities living near and around logging area. Although not specifically addressed in the current project, I have witnessed that mahout families (especially mahouts' sons) play an indispensable role in rearing calves born in captivity. Such captive breeding programmes have substantial influence on keeping alive the tradition of mahouts' sons to become mahouts; MTE has never found any difficulties in recruiting natural-born elephant care-givers, which is one of the major problems in captive zoo elephant management in the Western Hemisphere. Another added benefit is that, if and when the captive-born calves have opportunities to grow up with humans, they are more tractable than wild-caught animals, so they do not suffer from breaking- and taming-related stress. If I am fortunate enough to secure Rufford Booster Grant, I will also address the importance of the peaceful and fruitful co-existence of man and elephants in village level community meetings in market towns and in religious festivals by setting hoarding boards and posters, exhibitions, video showing, distribution of handouts, etc. I will address the importance of breeding elephants in captivity along with the subsistence of mahoutship to Myanmar Government.

**5. Are there any plans to continue this work?**

As stated above, we aim to update the studbook of timber elephants of Myanmar. The logbook material is a unique and extensive data set with an extremely valuable resource for research. It is vitally important that this data entry should continue for the foreseeable future by vets employed in the work force. We will propose a further grant from Rufford or Whitley Award to hire local field assistants to add data on elephants born and captured after 1999 and to fill missing information in the original studbook. We also aim to secure funding to equip Myanmar Vets with laptop computers to allow data collection in the field. In Myanmar, laptops are extremely expensive and regarded as luxury items and unavailable to ordinary Myanmar Government service personnel. Personal laptops would radically motivate the local vets to computerize all data from logbooks to spreadsheet.

**6. How do you plan to share the results of your work with others?**

We will convince the Myanmar Government to set up a centralized data bank on elephant biodata at the Head office of MTE and to give sufficient funding to set up elephant nursing camps. The project report will be translated into Burmese and distributed to the Myanmar Vets working at MTE. Preparation is underway to publish in high-impact journals such as *Nature*, *Science*, *Proceedings of National Academy of Sciences*, etc. to contribute factors effecting elephant calf mortality.

**7. Timescale: Over what period was the RSG used? How does this compare to the anticipated or actual length of the project?**

The RSG was used for 24 months from January, 2004 and January, 2006 instead of 12 months. Most of the information is in a PhD thesis, submitted to the University College London, UK.

**8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.**

Item	Budgeted Amount	Actual Amount	Difference	Comments
Subsistence allowance during the phase of analysis of studbook data to fulfil the requirement of PhD degree in University College London	£5,000	£ 5,160	£ 160	It was used for 24 months
<b>TOTAL</b>	<b>£ 5000</b>	<b>£5,160</b>		

**9. Looking ahead, what do you feel are the important next steps?**

The important next steps will be:

- (1) To publish the results in peer-reviewed journals.
- (2) To convince the Myanmar Government: (a) to set up an centralized elephant studbook; (b) to set up nursing camps; and (c) to readjust management of timber elephants for less stress, well-nourished and better husbandry practice.
- (3) To re-analyze the studbook data with newly-added updated data.

**10. Did you use the RSGF logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?**

Yes, I used RSGF logo in these presentations.

1. Mar, KU, Lal, M and Williams, DL (2007): Ocular diseases in Captive Indian Elephants. EU-Asia Link Project symposium on "Managing the Health and Reproduction of Elephant Population in Asia. 8-10 October, 2007. Faculty of Veterinary Medicine, Kasesart University, Bangkok, Thailand.
2. Mar, KU (2007): Myanmar Elephant Studbook Project: What are we learning from numbers? EU-Asia Link Project Symposium on "Managing the Health and Reproduction of Elephant Population in Asia. 8-10 October, 2007. Faculty of Veterinary Medicine, Kasesart University, Bangkok, Thailand.
3. Invited lecture at The Durrell Institute of Conservation and Ecology, University of Kent (2006).
4. Invited presentation at the Department of Animal and Plant Sciences, University of Sheffield (2007).

For publicity, I acknowledge the RSGF grant in these publications.

1. Clubb, R., Rowcliffe, M. J., Lee, P. C., Mar, K. U. & Mason, G. J. (2008) Compromised survivorship in zoo elephants. *Science*, 1649.  
(<http://www.sciencemag.org/cgi/content/abstract/322/5908/1649>)

2. Clubb, R., Rowcliffe, M., Lee, P., Mar, K., Moss, C. & Mason, G. (2009) Fecundity, survivorship, fatness and stress: why are zoo elephant populations not self-sustaining? *Animal Welfare*, *accepted*.
3. Mar, K. U. (2007) The Demography and Life-history Strategies of Timber Elephants of Myanmar, PhD Thesis, University College of London, London, UK. (<http://www.zoo.cam.ac.uk/ioz/pubs/Student%20Theses/Khyne%20Mar%202007.pdf>)
4. Mar, K.U., Robinson, M.R., Russell, A.F. and Lummaa, V. (in preparation) Early environmental conditions and senescence in elephants.
5. Mar, K. U (in preparation) Demographic changes of elephant population of Myanma Timber Enterprise by decade.

#### **11. Any other comments?**

I wish to extend my heartfelt thanks to the Rufford Small Grants for Nature Conservation, for the financial support which made possible for this project to achieve its fruitful results. Without its support, I could not finish my PhD nor able to publish in high-impact journal like *Science*.