

### 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.

Thank you for your help.

Josh Cole

#### **Grants Director**

Grant Recipient Details			
Your name	Anagaw Atickem Meshesha		
Brojoct titlo	The search on the golden jackal and a genetically distinct lion		
Project title	(Panthera leo) of Ethiopia		
RSG reference	14825-В		
Reporting period	March 2015		
Amount of grant	£ £11,700		
Your email address	anagawam@gmail.com		
Date of this report	March 2015		



# **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
African wolf distribution pattern		x		The most difficult task to fully address the spatial distribution of African wolf across its potential range that include 25 African countries (While African wolf confirmed in six African countries, its status in 19 countries remains unknown Table 1; Fig 1). The difficulties are both on collecting right samples of African wolf distinguishing from sympatric carnivores and processing export permit to laboratory facilities outside Africa).
Cryptic variation of Striped jackal of east Africa			x	The cryptic variations of striped jackal between the west and east Africa (Genetic distance of 0.13%; Gaubert et al., 2012) was not documented for samples of striped jackals from Ethiopia-Kenya border and west African countries (Fig 1; Fig 2). Striped jackals from Kenya (Wayne et al., 1997) remain unique.
Genetic diversity of lions of Ethiopia			x	From six lion populations sampled in Ethiopia (Fig 4), the lion population in western forest of Ethiopia (Gera forest) is the most distinctive population of all.
Un planed discoveries			X	While attempting in DNA exaction of lion samples, we end up on a pig sequence, this is likely from what the lion eats. The pig we came though is a closer species to the red river hog <i>Potamochoerus</i> <i>porcu</i> , a species not recorded in Ethiopia (based on mitochondrial DNA sequences including Cytb, 12s and 16s; Fig 5). Red river hog is known in the central and western African countries. Our first impression a red river hog which has never been spotted by researchers. Latter however, from the animal which was killed by the local people in protecting crops, we learn our pig was in fact from a cryptic bush pig and very different from the red river hog physical appearance (Fig 6). Whether this is a new pig species or rather a closer sub species of red river hog, I am working on the nuclear DNA sequencing with markers used by Gongora et al. (2011). I got over 50 samples representing bush pig and red river hog of central and western Africa from colleagues. With other



	wrong sample collected in Chewbahier, Ethiopia-		
	Kenya border, I come to the bat-eared fox		
	(Otocyon megalotis). Crab-eating fox is not related		
	to most of the other fox species, and it is rather		
	closer to the raccoon dog (Procyon lotor;		
Bardeleben et al., 2005; Fig 6). Details w			
	submitted on detailed report of Rufford in April,		
	2015.		

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

Getting samples for a DNA exaction is the most difficult task in this project. To fully acknowledge of the distribution pattern of African wolf, samples from the potential 16 African countries should be collected (Table 1; Fig 1). Getting export permit in some African countries are difficult by far than I originally imagined. The other difficulty is similarities of sympatric canid pellets that makes exclusive sampling of African wolf pellets difficult. Even small carnivores like serval cat which I expect to have much smaller pellet size and distinguishable from jackals remains difficult to be screened by their morphological features. Sequencing untargeted carnivore increase costs of lab work.

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

One of the most important findings of this project is the ever first report of the African wolf in southern Sudan. We also successfully samples Ethiopian lions from the western Ethiopia (Gambella) to the eastern Ethiopia and preliminary results indicates the lion population in the western Ethiopian forest is the most distinctive population. With my collaborator Eli K. Ruenessa, we also confirmed that African wolf is a unique taxon and not a hybrid with extensive sequence dataset (ca. 8.5Mb).

While not intended, the discovery of the cryptic pig species which is closer to the red river hog *Potamochoerus porcu* of central Africa was also one of the most interesting results of this project. This species was the confused with bush pig (*Potamochoerus larvatus*) during the past. The result of the combination of 2010 bp of mitochondrial DNA however showed it is rather a closer species to the red river hog which has never been reported to exist in Ethiopia so far. Nuclear DNA sequencing is underway. Much more information will be available in the detailed report to be submitted for rufford web site and published article in the coming couple of months

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

Local people were involved with this project as field assistance. But more importantly, the results of this project may open a new insight on the conservation effort of the lions and newly discovered cryptic red river hog which ultimately benefit the society.

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

Yes, the African wolf distribution pattern is something that needs collaboration of researchers and conservation managers across the potential ranges (Table 1). Further, this project reveals a cryptic



red river hog in western Ethiopia. This is an important implication for conservation. Even large mammals taxonomic status remains unknown in Ethiopia. During this study, we also noticed the high level of lion-human conflict possibly because of increasing loss of the natural pray of lions as a result of habitat loss. Two lions were killed in Gera area and one in Maze National Park in southern Ethiopia as a response of livestock kill by lions. There is a viable population of lions in the western tropical rain of Ethiopia, in particular Gera, but needs an urgent conservation plan for the population to sustain.

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

I am writing two manuscripts on canids and the cryptic pigs of western Ethiopia to be submitted for international journals. Results however will also be published on local newspapers and web site of Rufford in the near future. I also hope researchers will take these results to discuss on its different aspects on their blogs as done before <a href="http://carnivoraforum.com/topic/10096421/1/">http://carnivoraforum.com/topic/10096421/1/</a>

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

The RSG fund was used for a year so far and it is according to the plan. I however have samples to be sequenced with additional markers (region of mitochondria) and genotyping. I have laboratory supplies to be used. This work however will be completed in 2 months from now.

Item	Budgeted Amount (£)	Actual Amount	Difference (£)	Comments
Per diem for PIs	1280	1140 £ (Used in local exchange rate ETB 30.7, USD 1.5 and KES 136.4)	140	
Per diem for five field	5520	5620 £ (Used in local exchange rate ETB 30.7, SDG 9 and KES 136.4)	-100	
Atickem airfare	700	720 £ (Used in local exchange rate NOK 11.8)	-20	
Postal service	200	260 <b>£</b> (Used in local exchange rate ETB 30.7)	-60	
DNA extraction bead and Enzyme, sequencing, markers and laboratory supplies and Genotyping	2800	2600 £ (Used in local exchange rate NOK 11.8, USD 1.5, )	200	

## 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.



Transportation	1200	1360 <b>£</b>	-160	
including horse and		(Used in local exchange		
car rent		rate ETB 30.7, USD 1.5		
		and KES 136.4)		
TOTAL	11700	11700 <b>£</b>	0	

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

African wolf distribution pattern studies needs further work on wide range of African countries (Table 1). A full genome sequence on Africa wolf also may reveal the ultimate evolutionary history of the species. The lion-human conflict in Ethiopia is at the pic, three lions were killed since February 2014 in Gera and southern Ethiopia. We learn six to be killed during the last 3 years only in the western Ethiopia. In the western jungle forest of Ethiopia, habitat loss is increasing which deplete the natural prey population for lions. It is crucial to find a management in resolving the conflict. The bush pig in western Ethiopia were found rather a cryptic species closer to the red river hog. I am working on the nuclear DNA at the moment, further work to determine whether this is a unique small population or all the "bush pig" in Ethiopia including the population in the Bale Mountains are same cryptic pig species is important. There is also extensive hunting for food on this species in llibbabour zone while it is killed for crop protection in the adjacent zone in Jima that needs a conservation action plan. "Bush pig" are widely distributed in Ethiopia across the landscape that potentially can support a forest area (landscape with annual rain fall above 1270 mm; Fig 8).

### **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?

RSFG will be acknowledge in the upcoming publications and conference attended.

#### 11. Any other comments?

The discovery of the new African wolf, cryptic red river hog and genetic distinctive lions of Addis Ababa zoo reveals Ethiopia has a wide range of biodiversity which is still need to be studied and gets conservation effort. While limited effort is made for the research and conservation of biodiversity in the Ethiopian highlands, very little is known on the rest of the ecological zones of the country, and support by Rufford in wide range of ecological studies is greatly appreciated.



#### **Tables & Figures**

Table 1. African wolf status in their potential range that is the range of the golden jackal as indicated by IUCN (Jhala & Moehlman, 2008). Golden jackals are those which are confused with cryptic African wolf (Rueness et al., 2011).

No	Country	REGION	African wolf status
1	Tunisia	Northern Africa	Unknown
2	Algeria	Northern Africa	Confirmed
3	Morocco	Northern Africa	Unknown
4	Libya	Northern Africa	Unknown
5	Egypt	Northern Africa	Confirmed
6	Mauritania	Western Africa	Unknown
7	Mali	Western Africa	Confirmed
8	Niger	Western Africa	Unknown
9	Sudan	Northern Africa	Unknown
10	South sudan	Northern Africa	Confirmed
10	Chad	Middle Africa	Unknown
11	Ethiopia	Eastern Africa	Confirmed
12	Senegal	Western Africa	Confirmed
13	Burkina Faso	Western Africa	Unknown
14	Nigeria	Western Africa	Unknown
15	Cameroon	Middle Africa	Unknown
16	Djibouti	Eastern Africa	Unknown
17	Benin	Western Africa	Unknown
18	Somalia	Eastern Africa	Unknown
19	Central African Republic	Middle Africa	Unknown
20	Zaire	Middle Africa	Unknown
21	Kenya	Eastern Africa	Unknown
22	Uganda	Eastern Africa	Unknown
23	Tanzania	Eastern Africa	Unknown
24	Rwanda	Eastern Africa	Unknown
25	Burundi	Eastern Africa	Unknown





Fig 1. Golden jackal range (according to IUCN red list of endangered species on March 07, 2015) that potentially be the African wolf range.



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Fig 2. Maximum likelihood tree based on 420bp of Cytb analysed in MEGA. Striped jackals of Ethiopia-Kenay border grouped together with the rest of the striped jackal in the western African countries.





Fig 3. Maximum likelihood tree based on 380bp of 12S analysed in MEGA. Samples of striped jackal and Ethiopian wolf across the different regions of Ethiopia. We did not find any sample representing golden jackal sample so far.



Fig 4. Lion populations sampled for genetic studies in Ethiopia





Fig 5. Maximum likelihood tree based on 1200 bp of Cytb analysed by BEAST. Cryptic red river hog represented as Jimma sample 2 and 3.



Fig 6. Cryptic red river hog in Ethiopian tropical forest. Threatened by direct killing as a result of crop damage by the local people





Fig 7. Maximum likelihood based on 380 bp of cytb.



Fig 8. The potential "Bushpig" range in Ethiopia; landscape that potentially can support rain forest.



#### References

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Bruche, S., Gusset M., Lippold S., Barnett R., Eulenberger K., Junhold J., Driscoll C.A. & Hofreiter M. A (2013). Genetically distinct lion (Panthera leo) population from Ethiopia. *Eur J Wildl Res* 59: 215-225.

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Jhala, Y. & Moehlman, P.D. (2008). Canis aureus. The IUCN Red List of ThreatenedSpecies.Version 2014.3. <www.iucnredlist.org>. Downloaded on 13 March 2015.Species.

Rueness, Eli Knispel; Asmyhr, Maria Gulbrandsen; Sillero-Zubiri, Claudio; Macdonald, David W., Bekele, Afework; Anagaw Atickem & Stenseth, Nils Chr. (2011). The cryptic African wolf: *Canis aureus lupaster* is not a golden jackal and is not endemic to Egypt. *PLOS ONE* e16385:1– 5.

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