

Reducing Lammergeier deaths from powerlines in Lalibela, Ethiopia

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Introduction

The Lammergeier, or Bearded Vulture *Gypaetus barbatus*, is listed as Near-Threatened (NT) by the IUCN, with a decreasing global population of 1,300-6,700 birds (1). The mountains of northern Ethiopia are an important global stronghold of a breeding population of this iconic bird, famed for its unusual feeding habit of dropping bones onto rocks to fracture them into digestible fragments.

Lammergeiers are commonly seen scavenging in and around the town of Lalibela, Amhara region. The surrounding high mountains (e.g., Abune Yosef 4,260m) provide a very extensive suitable habitat for roosting and breeding. In recent years, Lalibela has expanded greatly, with many new hotels being built for the growing number of domestic and international tourists who visit the World Heritage-listed rock-hewn churches. The average number of foreign tourists visiting Lalibela has increased from 18,500 annually to more than 35,000 between 2007 and 2011-15 (2). This has benefitted Lammergeiers and other bird species by increasing food availability at slaughter houses and hotel refuse tips. However, the increase in human population has also led to many new power lines being erected, often across valleys through which these large scavenging birds fly when searching for food (Fig 1). Bird guides based in Lalibela are aware of the deaths of Lammergeiers and other large birds caused by these power lines.



Fig 1. A Lammergeier flying over power lines in Lalibela, 8th August 2019.

Collisions between large birds and power lines are a recognised global problem, and several mitigation methods have been shown to reduce collision frequencies by 50-60% (3). In Europe, the main causes of deaths of Lammergeiers are intentional and unintentional poisons (38%), shooting (31%) and collisions (18%) (4).

The main aims of this project were to: estimate the size of the Lammergeier population within 5km of Lalibela; to determine the mortality rate of this species through interactions with power lines or other factors; to survey the local farming community's knowledge of this species and its importance in the ecosystem; and to raise awareness of the problem.

Methods

Training and site selection

As leader of the project team, Abebe Baye recruited three local people with an interest in wildlife (Sintayenu Shiferaw, Tesfa Moges and Zewdu Hailu) to help with counting the Lammergeier population. Together, we organised and took part in a training course on 27 August 2019 at the St Lalibela Vocational Training Centre. Mr Amlaku Teketay, from the University of Mekele gave a general introduction on wildlife and the ecosystem (Fig 2), and then Abebe spoke about birds, identification, and the project (Fig 3).



Fig 2. Amlaku Teketay giving an introduction at the training course



Fig 3. Abebe Baye describing the Lammergeier

On the following two days, 28-29 August, we practised identification of vultures, eagles and other raptors in the field. The different plumage colours in different age groups of the same species caused some problems, so Abebe worked very closely with the team to improve their identification skills.

During these two days of field work and extensive observation of Lammergeier flight patterns (common directions of travel, time of day), five sites were identified for Lammergeier counts (Fig 4). These sites were chosen as they were known to be frequented by Lammergeiers, for their relative ease of access, and to provide the best non-overlapping coverage of the area. Lammergeiers roost

and nest in the high mountains situated to the north-east and east of Lalibela, and they fly towards the town at around 08:30 each morning. The general pattern is that they first approach site B searching for carcasses and later fly to the south and west of the town, where sites C, D and E are located, and then northwards to site A.

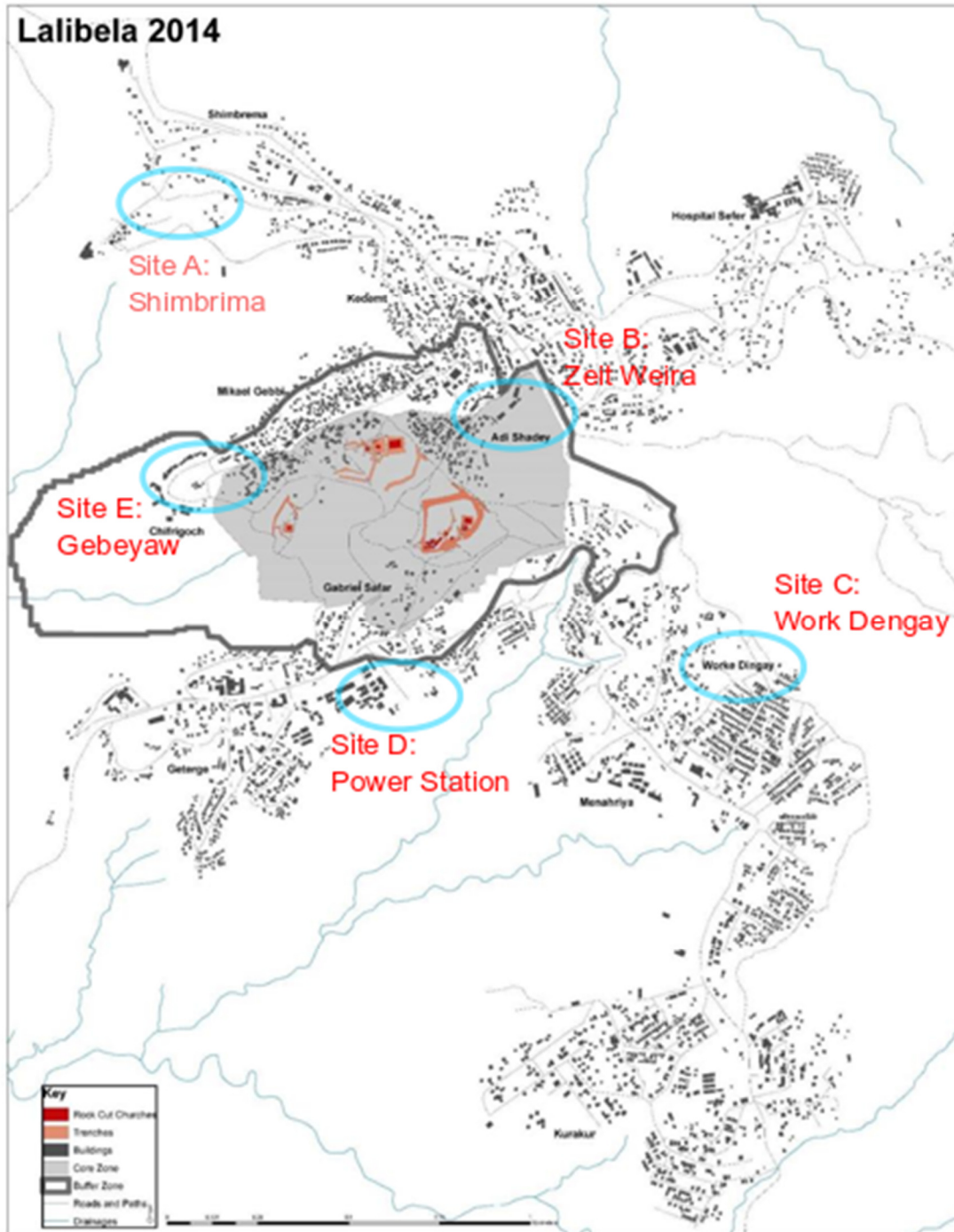


Fig4. Map of Lalibela and surrounding suburbs, showing the location of the count sites. (Map sourced from Ref 1).

Site A: Shimbrima, to the north-west of the town, where most hotels and restaurants are located. Waste food and refuse is disposed of around the cliffs. Several power lines run from the ridge to the valley below. A dead Lammergeier was found at this site in November 2018 (Fig5).

Site B: Zeit Weira, a communal slaughter place, and an area with no power lines. We suspect that poison may sometimes be used kill vermin in the area.

Site C: Work Dengay, a suburb to the south-east of Lalibela, where there are many power lines.

Site D: Lalibela power station and associated nearby high voltage structures.

Site E: Gebeyaw, a site similar to Zeit Weira, with communal slaughter places and no power lines. Birds may be killed by poison in this area.



Fig5. Dead immature Lammergeier found in Shimbrima, November 2018

Counting

Counts were made in the morning when the birds are flying and actively searching for food. The sites were counted simultaneously, with one trained observer counting each site using binoculars.

We used mobile phone communication between observers to try to minimise double-counting of birds. At pre-agreed times during our counts, we counted all of the Lammergeiers at each site. When a bird flew from a site, we phoned the observers at other sites and informed them of all relevant details of the departing birds (how many; immature or adult; direction and height of flight; together with other species?). We believe that this method greatly reduced double-counting; it also had the advantage of enabling us to identify 'new' birds entering the counting zone that had not already been counted at one of the sites.

On four occasions, Abebe combined counts across two nearby sites (A + E). The first count was held on 9th September 2019 between 09:00 and 11:00, and eight more counts were completed, about every two weeks, until 22nd December 2019.

For the count on 18th October 2019, a new method was used to estimate the maximum number of Lammergeiers. For this count, bones were collected from a butcher's shop (Fig 6), broken up using a hammer, and distributed at every observation site during the previous night. The crushed bones were distributed at 20:30 to protect them from different scavengers before counts started the next morning. The count was started earlier in the morning, at 08:30. This method was very successful and repeated for three later counts.



Fig 6. Abebe crushing bones to distribute at count sites

Mortality estimation

We informed many people in the local community about our project, and asked them to report dead and injured birds. Using this information, we expected to be able to identify which power lines were mainly responsible for causing deaths and injury to large flying birds, including Lammergeiers. This was only partly successful because local people do not consider the death of the birds to be unusual, so they did not always inform us.

Community Survey

We designed and carried out a survey during January 2020 of the highland farming community views on the impact of a rapid decline (possible extinction) of the Lammergeier population. We asked many questions to find out how well they know this bird and whether they understood the problem of birds being killed:

Do they know the Lammergeier and what it eats? Do they know about the rotting carcass disposal service provided by Lammergeiers? Do they know the birds are killed by power lines? Do they think something should be done?

Results

Counts

The total number of Lammergeiers counted on each day during the observation period varied from 41 – 118 individuals. Our method of scattering bones at observation sites clearly attracted more birds, and it suggests that a maximum number of 118 individuals feed regularly in the town. We could not eliminate some double counting as birds moved between sites, so this should be regarded as an upper limit of the population.

Table 1. Lammergeier counts during September – December 2019 in Lalibela

<u>Date</u>	<u>Time</u>	<u>Counters</u>	<u>Sites</u>	<u>Lammergeiers</u>	<u>Comments</u>
09/09/19	09:00-11:00	4	5	56	
22/09/19	09:00-11:00	4	4	67	
05/10/19	10:00-12:00	4	4	48	Later start because of cloud
18/10/19	08:30-11:30	4	5	118	Bones placed at sites during night
31/10/19	09:00-11:00	3	3	41	Abebe not available
13/11/19	08:30-11:30	4	4	86	Bones placed at sites during night
26/11/19	09:00-11:00	3	3	74	Sintayenu not available
09/12/19	08:30-11:30	4	5	88	Bones placed at sites during night
22/12/19	08:30-11:30	4	5	82	Bones placed at sites during night

During the count on 18th October, we estimated the ages of observed Lammergeiers as immature (< 7 years) or adult (>7 years) using the illustrations and information in Ref 2 (Table 2). More detailed age estimation in visual surveys of Lammergeiers is reported to overestimate numbers of immature (<2 years) birds and underestimate sub-adults (3-5 years) and adults (>6 years) (5).

Table 2. Lammergeiers counted on 18th October 2019 after bones were placed at all sites

<u>Observer</u>	<u>Site</u>	<u>On Ground</u>		<u>Flying</u>		<u>Totals</u>		
		<u>Imm</u>	<u>Adult</u>	<u>Imm</u>	<u>Adult</u>	<u>Imm</u>	<u>Adult</u>	<u>All</u>
Abebe	A + E	14	12	10	8	24	20	44
Sintayenu	B	18	10	4	4	22	14	36
Tesfa	C	0	0	7	5	7	5	12
Zewdu	D	9	7	6	4	15	11	26
Totals	A - E	41	29	27	21	68	50	118

Mortality

In August 2019, just before we started our training course, an injured Lammergeier was reported to us. It had flown into a high-voltage power line and could not fly. After taking it to a veterinary doctor who gave it an antibiotic, Abebe then he took it to his home to look after it (Fig. 7). The bird started to recover, but neighbours complained about the smell of the bones and meat that Abebe was feeding it with, so it was taken to a large compound outside the town, where it later died.



Fig 7.The injured Lammergeier with broken wing, August 2019.

During the period August 2019 – January 2020 we also received information that two more Lammergeiers had

been killed, but we did not see the corpses to confirm identification.

We have witnessed and photographed two Lammergeiers killed by power lines in Lalibela during November 2018 – August 2019. Villagers also reported another two birds of this species were killed during August 2019 – January 2020, but we cannot confirm identification. Earlier information from villagers, from November 2018, was that three Lammergeiers had been killed by power lines in the Shimbrima area over a period of less than two weeks. However, we were unable to confirm identification. The areas where birds appear to be most at risk of colliding with power lines are sites A (Shimbrima), C (Work Dengay) and D (Power Station and Substation). These three sites appear to be responsible for the deaths of most Lammergeiers and other big birds.

Community Survey

Our survey showed that the highland farmers know the Lammergeier well, and they have three local dialect names for the bird. The most common name is “Kiltem Sebari”, meaning “bone crusher”, which shows that the farmers know about the unusual feeding method of the bird.

A second name, which is well-known in the highlands of north-west Ethiopia, is “Yellos”, which has no directly equivalent English word. It literally means ‘something huge that can pick up something big’. When highland farmers get angry with their children, they may say “Yellos Yansah”, meaning ‘let the huge bird pick you up’.

We also discovered a third name, “Kuru Timb Ansa”, which literally means the ‘pride vulture’. This name showed that people were aware that the Lammergeier ‘cleaned up’ by eating the bones after other vulture species ate the flesh. Some farmers said that it was important for the Lammergeiers to clean away carcasses.

Many farmers were aware of the value of Lammergeiers as an attraction for tourists who hike in the mountains and climb Mount Abuna Yosef. Some farmers benefit from these tourists, with home stays, renting donkeys, and working as mountain guides.

Most of the farming community were unaware that Lammergeiers were being killed by power lines in Lalibela. They said that, if they could, they would like to stop the birds flying to Lalibela to find food. Many had no idea how to protect the Lammergeiers, but some suggested getting slaughter houses and hotels to move carcasses away from the power line areas. Another idea was to move power lines away from the cliff sides.

Discussion

The results of this project indicate that a population of up to 118 Lammergeiers use the Lalibela as a scavenging area. Despite our precautions, some double-counting will have occurred, meaning that the true population in the area would be lower; 118 individuals is likely to be an over-estimate.

Because of the difficulty in getting reports of dead and injured birds, our Lammergeier mortality count is very likely to be an under-estimate. Two birds, one immature and one adult, were confirmed killed during November 2018 – August 2019, and unconfirmed reports suggest several more deaths. Even the confirmed death rate is an alarming statistic; 2 birds in 118 (1.7%). We believe the true rate is more likely to be of the order of 5-10 birds in 80 (6 -12%).

Lammergeiers breed first at 7 years old and in Ethiopia breed only every second year, raising on average less than one young (6). The death rate suggests that the power lines may be having a devastating impact on the Lammergeier population in the Lalibela area. There is a strong awareness

of the importance and value of Lammergeiers within the highland farming community. However, this awareness is less common among people living in the town of Lalibela, and there is less recognition of the potential problem being caused by the deaths of these birds – it is seen as not unusual.

At the present time, the Covid-19 pandemic has caused a lockdown in Ethiopia, so we have had to terminate the project. However, with this report we hope to highlight the problem and make the town community, local politicians, and the tourism office aware of the potential impact that the decline and potential extinction of this species may have.

Acknowledgements

We would like to thank the St Lalibela School and school community for permission to use the classroom and human resource.

We would like to express our gratitude to Tadele Travel for providing technical, material and ideal support and particularly Girma Moges, who did a great job. We would like to thank Alan and Sue McGillivray for their kind help and helpful advice and the latter becoming a member of ABC.

We would like to thank Philippa Tadele for her great help and also we would like to thank Tadele travel team in Lalibela for their contribution. The Lalibela Tourism and Lasta Tourism Office are thanked for their help in undertaking the project.

We are grateful to Stephen and Pat Pringle for discussions and help in drafting this report and to the African Bird Club for their Conservation Fund Award of £1,281 which covered the costs of the project.

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