

**Status and Viability of Lilian's Lovebird *Agapornis lilianae* in Liwonde National Park Malawi**



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## **EXECUTIVE SUMMARY**

Lilian's Lovebird *Agapornis lilianae* is recognized globally by IUCN as a Near Threatened species with a resident population in Malawi only known from Liwonde National Park. In October 2006, during the Liwonde National Park (LNP) annual game count, over 20 Lilian's Lovebirds were discovered dead at a water pool. Upon inquiry with LNP staff it was discovered that community members often use poison to capture birds and small mammals in the park. This study aimed to assess the current status of Lilian's Lovebird in LNP and also to investigate the hunting activities of the communities around the park.

Fieldwork began towards the end of March 2010 with a reconnaissance visit. Data collection was conducted in May-July 2010 and then again from late September – mid December 2010. The four main data collection methods used were: transect walks, drive transects, waterhole counts and point counts. These methods were used at the three main research bases (Chinguni, Mvuu and Mpwapwata) to ensure even coverage of the park. In total, 17 transect walks, 5 waterhole counts and 5 drive transects were conducted. Overall, 2,113 Lovebirds were recorded during the study. The highest numbers were recorded in the park's central area (Mvuu Sanctuary) followed by the northern part (Mpwapwata area, especially along lake Mphalombe). The lowest numbers were recorded in the Chinguni area. The lovebirds are widely distributed throughout the park, with sightings from Namisundu River all the way to the north.

There is a sub-population of birds that cross the Shire River and spend the day on the other side, returning in the evening. Another sub-population crosses the park on the eastern side, flying towards the Lake Chilwa area. A third sub-population stays almost always within the park, especially around the Sanctuary and a waterhole along transect 21 in the north. From these findings, the population that is most susceptible to hunting is the one that flies east towards Lake Chilwa. There is a need to investigate further these different movements and their target destinations.

Lilian's Lovebirds were mainly observed feeding on the seeds of the Yellow Fever Tree (*Acacia xanthophloea*) and the fruits of the Woolly Caper Bush Tree (*Capparis tomentosa*) in the south and central parts of the park. In the north however, in addition

to these two species, they also fed on the petals, sepals and immature fruits of the Baobab Tree (*Adansonia digitata*) and the fruits of some fig trees (*Ficus* spp.). The lovebirds were also recorded feeding on seeds of herbs and grasses on the ground. Three roost sites were identified, one in the south, upstream of Namisundu bridge, one in the Rhino Sanctuary and another on the road to Masanje from Mvuu. A minimum of four nest cavities were found in each site. These sites are also likely to be breeding sites as birds were still using the same holes till mid-February. Male head bobbing, part of a courtship behaviour, was first recorded in November.

During this study only one poisoned waterhole was recorded. This likely results from the increased long patrols that have been introduced by the park management. Poacher activity was however still evident by wire snares found during transect walks. Only two of the communities questioned admitted to hunting in the park. The rest mentioned other areas of hunting. A few of the households admitted to hunt parrots of different kinds (Meyer's Parrots, Brown-headed Parrots and Lilian's Lovebirds). The study established that the generic name for parrot species is Ngwee /Chingwe in Chichewa and Yao languages, whilst some communities specify Lilian lovebirds as Chimbuli (singular)/Zimbuli (plural).

Hunting in the park is a seasonal event mainly occurring during the dry season. However, hunting also occurs in the agriculture fields by a larger community thus making it an activity throughout the year. Communities admitted that they set traps for the lovebirds in their gardens as they see them as a pest. The use of poison for hunting was only mentioned during focus group discussions. Most respondents mentioned traps and 'bird rubbering' (i.e. placing a sticky substance on trees where the birds are known to land so that they get 'stuck' on the tree) as the main hunting method.

In conclusion, there appears to be a viable population of lovebirds in the park. They are directly targetted in the fields outside the park. It is now important to understand what part of the population leaves the park to forage in people's planted fields. This will determine the proportion of the population that is endangered through hunting. It may be that the poisoning in the park is not the main threat but rather the one in the fields, as it occurs during the breeding season.

## **INTRODUCTION**

Lilian's Lovebird *Agapornis lilianae* is a Near Threatened species occurring in central southern Africa (Mozambique, Zimbabwe, Zambia, Tanzania and Malawi (BirdLife 2008). The species occurs in large flocks strongly associated with Mopane (*Colophospermum mopane*) woodlands. In Malawi, it is known only from Liwonde National Park (LNP). Little is known about the Lilian's Lovebird biology, abundance and distribution in the park.

The current hunting activities of the surrounding communities pose a great threat to these birds. Hunters poison small pools of water during the dry season when water is scarce in the park. Lilian's Lovebirds are victims of this hunting and have several times been found at these poisoned water points. The main objective of this study was to collect primary data on the distribution and abundance of the lovebirds in the park. The project also aims to find out more about the hunting activities of the surrounding communities and quantify the threat they cause to LNP's birdlife. The key objectives for this study were as follows:

### ***Specific objectives on ecology:***

- To estimate the population size of Lilian's Lovebirds in LNP
- To map their distribution in LNP
- To evaluate its current Malawian Red Data Book status
- To plan future monitoring and conservation management.
- To study the habitat preferences, diet, breeding biology and local movements of the birds.

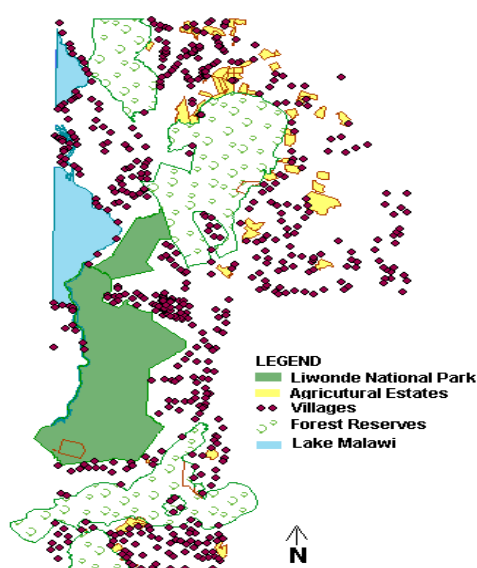
### ***Specific research questions concerning hunting:***

- How many hunters are there in the local communities?
- Is it a full time practice or only occasional activity in the dry season?
- How much live trade is there in Lilian's Lovebirds?
- Are these subsistence or commercial hunting practices?

## METHODS

### *Study Area*

LNP covers an area of 548 km<sup>2</sup> and ranges in altitude from 474-921 m above sea level. The high human population density around the park puts a lot of poaching pressure on LNP. The park is considered to have a 'hard' boundary without a buffer zone along most of its length (Thomson 1998). Around the borders of LNP is a high density of villages with approximately 100-115 inhabitants per km<sup>2</sup> (FAO, 1997) and a total population of thousands. The annual human population increase of 2.5-5% places great pressure on land, particularly protected areas.



**Figure 1:** Map 1: Showing high density of villages surrounding the Liwonde N.P. (Map created in ESRI ArcINFO by Lawrence Luhanga, 2006. Source courtesy of Frankfurt Zoological Society).

LNP is bounded in the west by the Shire River and Lake Malombe and in the east by hills and ridges of the escarpment. The topography is gently sloping, upward from the river, and is broken by two isolated groups of hills. The annual rainfall recorded from 1977 to 1995 by the Research Unit at Chinguni was 999 mm with a maximum recording of 1,091mm (Happold & Happold 1990) and a minimum of 401 mm (Bhima 1998). Over a nine-year period (1986-1995) the same station recorded mean maximum temperature of 31.2°C for November and mean minimum temperature of 18.5°C for July.

## Study design

### Transect walks

As seen in Figure 2 below, LNP has 25 predetermined transects of different length. Ten of these transects (3,5,7,9,11,13,15,17,23,25) were walked. Transect 25 (not shown on map) was added as scouts at the closest camp (Mpwawata) said that they have seen many lovebirds in that area. An additional three transects, not shown on the map, were also walked. These were done following information that lovebirds occurred in the area. These were Chiguni circuit, Mpwawata camp to water ole close to Transect 21 and park boundary along Lake Malombe. The transects differed in length, the shortest was 1.8km and the longest 12.6km.

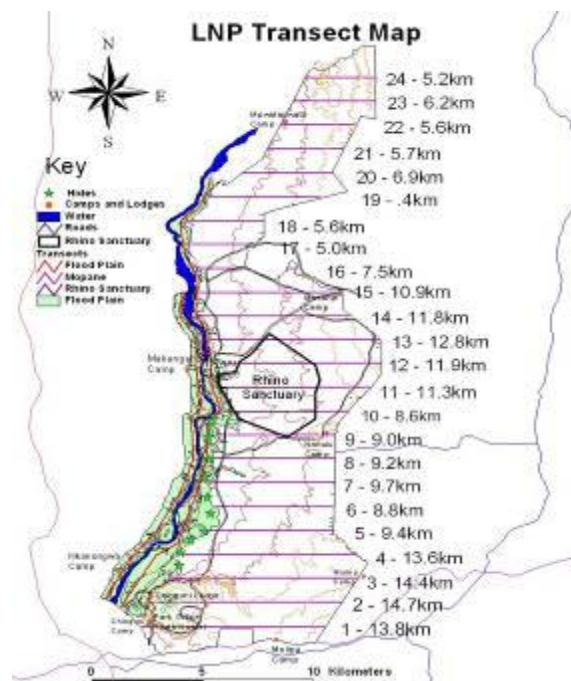


Figure 2: LNP map showing transects used in game counts

Each transect was walked from 05.00 h to 11.00 h. At each point the lovebirds were encountered the number of birds, time, locality and activity were recorded (Warburton & Perrin 2006). GPS recordings were taken on all lovebird sightings, at watering points and breeding sites. Every 500 m along the transect, observers stopped for 3 minutes and all birds seen or heard within a 50 m radius were recorded. Number of individuals, perpendicular distance to the transect and macrohabitat type were recorded (Mwangomo et al. 2007). Each transect was walked twice, once in May - July and once in Sep - Dec.

## **Drive Transects**

Five vehicle transects were driven: one from LNP main entrance to Mvuu Camp and four other transects (Chinguni-mvuu; Nafiulu-masanje loop; Mvuu-Mvera riverside; Mvuu-Mvera via Masanje; Namandanje-mvuu riverside).

## **Point Counts and Observation**

Censusing points were established once breeding, feeding and water source data had been identified from the transect walks. Census plots extended in a 100 m (+) radius around each point. Since Lillian's Lovebirds breed in colonies, the idea was to have plots encompassing the main nesting trees. A group identified in these census points was observed for up to 30 minutes, and all activities and time recorded.

An additional point count was added at the camp site at Jacqueline and Brookes (J & B). Large flocks of Lillian's Lovebirds were seen flying over the camp site across the river every morning. Three counts were done at this spot. Two during the morning (12/11/2010 from 05.30 -09.30; 16/12/2010 from 05.30 – 08.30) and one during the afternoon hours (4/11/2010 from 15.30 – 17.45). Double counting was avoided because birds only flew in one direction (east to west) during the morning hours

## **Waterhole counts**

Counts were done at all of the waterholes in the Rhino Sanctuary during the dry season. For all lovebirds that came to drink, the time, flock size, behaviour, presence of other species, pool location and type was recorded (Warburton & Perrin 2005a-d, 2006).

## **Community Survey**

Five communities bordering LNP were surveyed. Selection was based on information from scouts on which parts of the park experience the most evidence of hunting. In each village a maximum of 25 households were interviewed. Focus group discussions were also used to acquire information on the hunting activities of each village. The Birds of Africa South of the Sahara (Sinclair et al. 2004) field guide was used in all discussions.



## RESULTS

### Population Estimates

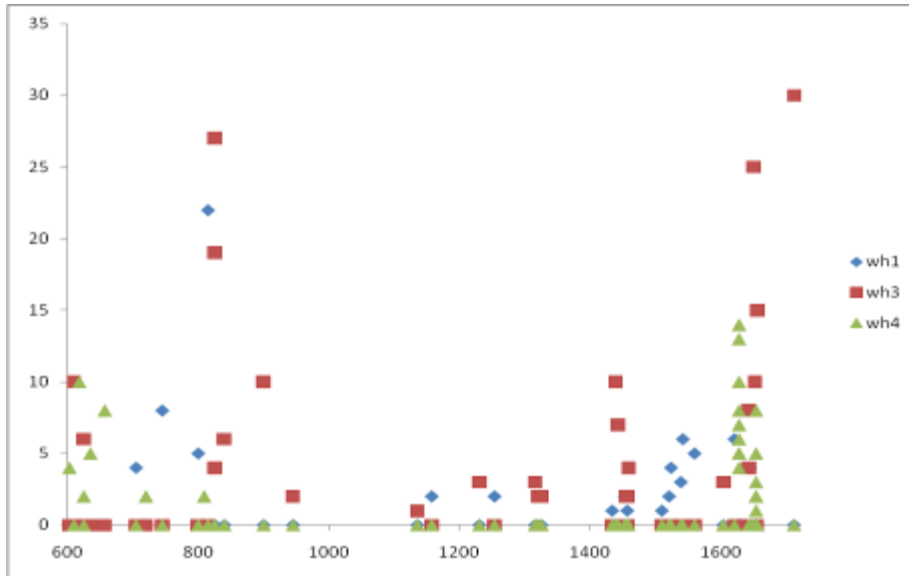
A summed distance of 152 km was covered during transect walks whilst another 93 km was covered on drive transects. More lovebirds were recorded at waterholes than in any other area. The table below summarises the average number of lovebirds seen in each area at the waterholes and along the transects. To avoid double counting, only morning counts were used. Using these data we estimated a population of at least 2,000 individuals in the park.

**Table 1: Average counts for population estimates**

Area	Points selected	Average
Chinguni	Walking transects	19
	Roost site	22
	Drive transect	50
Mvuu	J & B	583
	Acacia feeding point	52
	Mvera root	20
Mpwawata	Waterhole near T21	201
	Along Lake Malombe	306
	Acacia/baobab point	166

Table 1 shows only records for Sept-Nov as this was the easiest time to see the birds because there is little foliage on the trees. Thus it can be assumed there was better detection during this time. The southern area around Chinguni appears to have the lowest populations: however this is likely to be different when there is more water in the park. In January for example, groups of up to 100 Lilian's Lovebirds have been recorded outside the main gate at Chinguni.

Figure 3 shows the daily activity pattern of the lovebirds at waterholes. These are the sightings for the three waterholes in the Sanctuary, conducted on the same day. It can be clearly seen that waterhole 3 has the highest number of lovebirds coming to drink, just after 08.00h and again after 04.00. The average number of lovebirds visiting a water hole in the morning was 53 whilst in the evening it was 113.



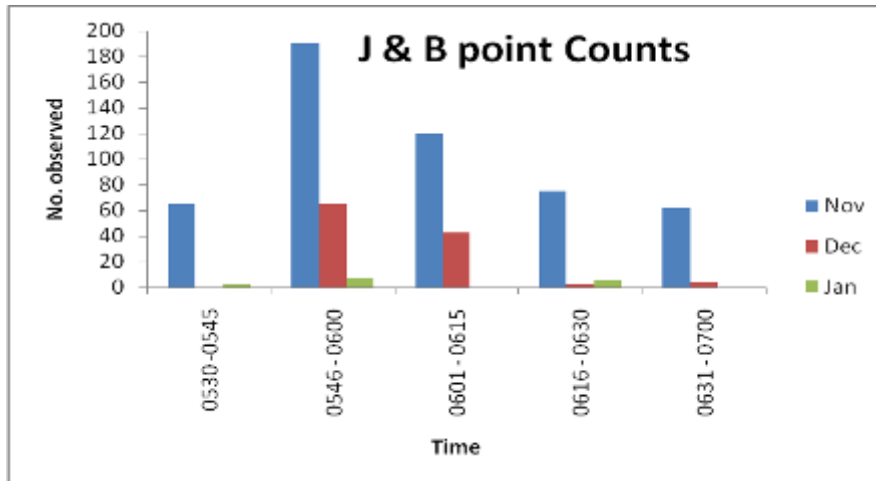
**Figure 3: Observations of lovebirds at Waterholes 1, 3, 4 in November 2010**

A different trend is seen when the July and November data from one waterhole point are compared. The general trend in the very dry month (November) is that there are many birds in the morning, almost no sightings in the afternoon and then high numbers again in the evening, whilst almost the converse is seen in July. No lovebirds were observed at waterholes in the northern part of the park (Mpwawata) during June-July. However over 200 Lilian’s Lovebirds were present during the November count. The pattern in which they used the waterholes differed completely from the pattern observed at water holes in the central area of the park (Sanctuary water holes). At Mpwawata, the birds generally stayed around the waterholes the whole day, only moving briefly into the nearby trees and then back to the waterhole.

### **Point observation**

Three roost site observations were carried out. Each site had a minimum of 5 confirmed occupied holes. Lovebirds arrived at roost sites at between 17.00 h and 17.30 h. They explored different holes around the area and went into the selected cavity by between 18.00h and 18.35 h. In the morning, the lovebirds left their roosts between 05.00 h and 06.30 h. This pattern seems to differ depending on day length and weather. In January for example, birds did not enter their roost till about 18.30 h and only departed roost at 06:30 am. The number of birds going into one cavity varied from 1-4 individuals.

At the J & B count spot, 963 individuals were counted during the three counts. The majority of them (583) were during a four-hour morning count 05.30 - 09.30 h in November. There is a significant difference between the November count (before the rains started) and the December count (after some rain). The January count had even fewer birds crossing at J & B. Figure 4 below shows this difference:

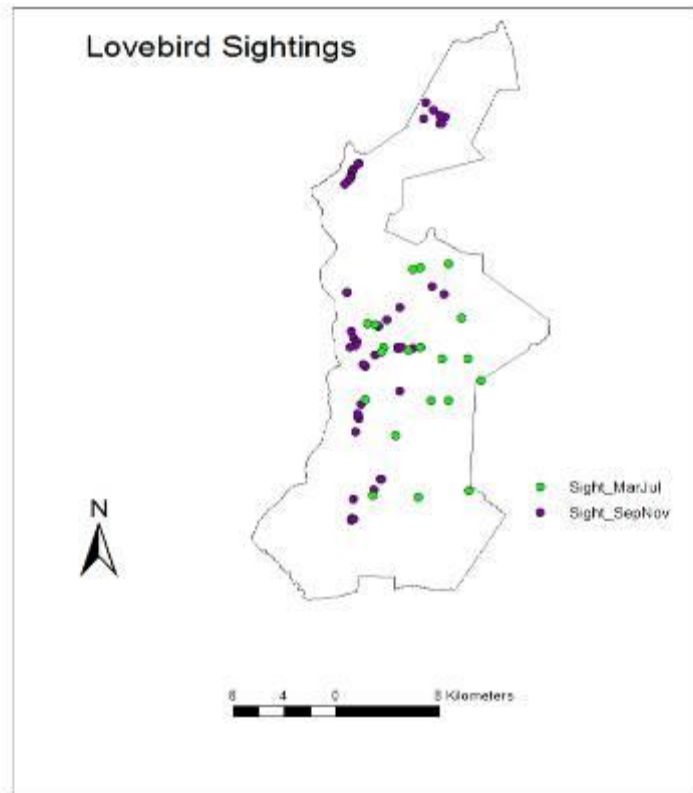


**Figure 4: Counts of lovebirds at the J n B chalets in Nov, Dec & Jan**

## Distribution Map

A significant difference was seen between observations in the May-July period and those in the Sep-Nov period. Lovebirds are more widespread during the rainy season whilst they concentrate around water points during the dry season. More records of sightings have been received from the feedback forms left at the gates of the park. These are yet to be included in the map. Verbal reports state that the lovebirds are being seen further south even outside the boundary

A report of lovebird sightings in Kasungu National Park and Phirilongwe Forest Reserve was received during this study. The team did not manage to visit Kasungu but reports from some staff members said they had not seen any lovebirds in Kasungu. Phirilongwe was visited in November 2010 however no lovebirds were observed. The forest assistant at the site stated that the birds are often seen there in June. It would be worthwhile to check this site.



**Figure53: Lovebird distribution in Liwonde National Park**

## **Feeding**

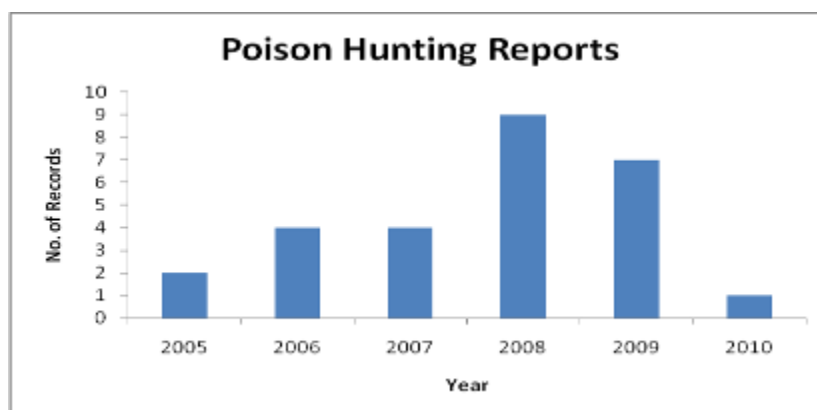
Lilian's Lovebirds were recorded feeding in *Acacia xanthophloea* (Yellow Fever Tree). They skilfully opened the fruit (pod) and fed only on the seeds inside. Fruits of the (Woolly Caper Bush Tree) were also eateng. These two plants were the main food items recorded in the Chinguni and Mvuu areas in the dry season. There were few occasions where the lovebirds were recorded feeding on seeds of grasses and shrubs on the ground. In Mpwapwata, fruits of *Ficus sp.* and *Adansonia digitata* (Baobab) flower petals, sepals and immature fruit were also eaten. In January lovebirds were observed feeding on young fruits of *Sclerocarya birrea* (Marula) trees.

## Breeding

Courtship behaviour was first noted in November 2010. This was male head-bobbing and courtship feeding. However visits in December and January showed that breeding had not began. More pairs were recorded performing courtship feeding in January. The same cavities used as roost sites are also used for breeding. These cavities were all in Mopane trees at an average height of 9.78 m above the ground.

## Hunting

During the study, no poisoned waterholes were encountered by the research team. Scouts at Nafiulu camp reported they encountered a poisoned pool in the middle of Namandanje dam on 17/9/2010. The poison appeared to be a day old and the scouts buried the pool by covering it with soil. There are significantly lower numbers of poisoned dams recorded than in previous years (Fig 6).

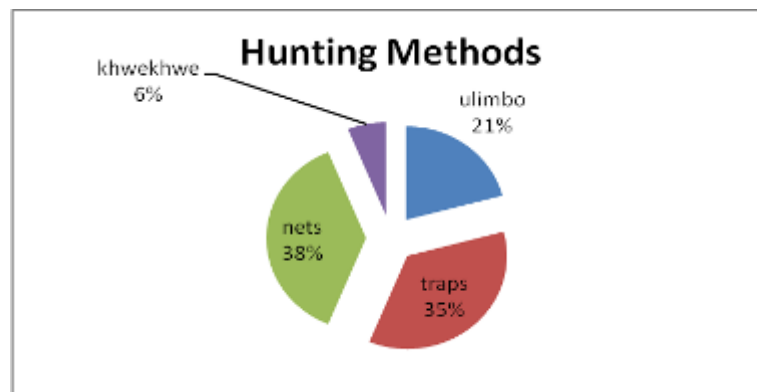


**Figure 6: Reported incidents of poison hunting**

The most incidents of poisoned hunting were recorded by scouts at the Chinguni and Molipa camps, followed by Naifulu camp. The most commonly used poison is Termic. However, hunters also use natural poisons made from *Euphorbia* and *Triphosia* tree species. A few records have also been made of other types of hunting such as the use of traps (for guinea fowl) and ‘bird rubbering’. In each area covered by patrols there are some key areas where repeated poison hunting incidents are recorded. These include Chinguni Camp (Nachibwira Dam, Mwalasi) and Naifulu Camp (Bilira waterholes, Namandanje dam).

## Hunting Methods

Ninety one percent (N=85) of all households question said they knew of bird hunters in their area. However, only two of these would give a specific name of a hunter. Many of them recommended that we approach the village headman as they would know who the hunters in the village were. Hunting in the park is a dry season activity only. However people continue to hunt in their field from around March. This is because Lilian's Lovebirds are seen as a pest and they destroy their crops (maize and rice). Several methods of hunting were mentioned by the communities.



**Figure 7: Methods used for hunting birds (N=85)**

None of the questionnaire respondents mentioned the use of poison as a method of hunting. However, the use of poison was mentioned in the focus group discussion in the southern communities where everyone agreed that, though it is an easy method it is destructive. Communities in Mpwapwata however, said that no one used poison. This was also confirmed by the scouts. Each village that agreed knowledge of hunting always said it didn't occur in their village but in another village.

## Hunting Motivation

Half of the respondents stated that hunting was undertaken for both consumption and sale. Most birds are sold locally and others in bars in the Liwonde township.



**Figure 8: Reason for bird hunting (N=85)**

Participants of both the questionnaires and the focus group discussions in all the areas stated that there was no live trade taking place. This was confirmed by Mr Dirk Van del Abeele (lovebird expert) who investigated local markets. Most of the lovebirds being bred in Blantyre are actually Fischer’s Lovebird *Agapornis fischeri* (Tanzania) or cross breeds between Fischer’s Lovebirds and Lilian’s Lovebirds.

### **Hunting Ground and Hunted Birds**

Only one focus group meeting discussion agreed that people go into the park to hunt birds. Most of the other respondents gave the answers ‘nearby bushes’, ‘rice fields’ or ‘Namandanje river’. The most common response was that hunting took place in rice fields. Nineteen bird species were among the most hunted species and are listed in Appendix 2. Fourteen percent of the respondents mentioned parrots (Chikhwe) as one of the most hunted birds.

It was difficult to single out Lilian’s Lovebirds in other areas as people use the name ‘Chikhwe’ or ‘Zikhwe’ for all parrots, including lovebirds. However in some areas (e.g Masanje) they have a separate name for the Lilian’s Lovebird called ‘Chimbuli’ (singular) or ‘Zimbuli’ (plural). This is literally translated ‘stupid’. According to one village headman, this name was given to them particularly because they are so easy to catch in the fields. Community members around the Masanje areas showed that they knew their birds very well. They were able to explain many behavioural habits of the Lilian’s Lovebird and could distinguish it easily from Brown-headed Parrots and Grey-headed Parrots.

## DISCUSSION

The population of Lilian's Lovebird in the park is quite stable. Estimates predict at least 2,000 individuals spread through the park. This is higher than the prediction of 1,000 birds reported by Doveset & Dowsett-Lemaire (2006). The seasonal distribution of the birds in the park is clear. They are much more widely spread during the rainy season while they concentrate around the river during the hot dry months. Thus, the availability of water in the park is a key factor determining the species' distribution, as shown for the Black-cheeked Lovebird (*A. nigrigenis*) in Zambia (Warburton & Perrin 2006).

Another determinant is the availability of food. Having such a reliance on water, one would expect the birds to stay around the water in the Sanctuary during the hot afternoons, but they prefer to cross the river. This suggests that water is not the only factor determining their distribution. The availability and diversity of food also has an important role.

This is also evident by the population that moves towards the east to Lake Chilwa where there is another important food source. The diversity and / or quality of food in the park may not be as good as outside the park. A comparison of vegetation between the areas where the lovebirds forage and feed in the afternoons, and the Sanctuary area, would enable acceptance or rejection of such a hypothesis.

In Mpwapwata, a tiny waterhole was used by over 200 lovebirds continuously during the day, suggesting that another determinant of distribution is how other species use the waterholes. No large mammals visited the waterhole during watches at Mpwapwata, in the Sanctuary. Each time that the lovebirds were drinking at the waterhole there were no other large mammals, such as elephants, nearby. They prefer using waterholes with no large mammals present. This point also requires further study.

The way Lilian's Lovebirds used the waterholes differed significantly during the study according to season. During the cold season more lovebirds were seen during the afternoon than in the evening (Warburton, 2005). In July it gets light much later in the morning, so the lovebirds emerge later and roost earlier. There is a continuous



presence at the pool in the afternoon in winter while in summer very few birds drink at the pools in the afternoon, possibly because they feed further away from the waterholes in the Sanctuary. They may breed during May-July. This will be confirmed once breeding data have been collected.

The significant drop in poison hunting is a very positive one. The scouts at Masanje and Ntulira camps have intensified their patrols and coverage, and thus people in the communities are concerned about losing this form of hunting, as it requires one to sit and wait to prevent being caught.

Poisons are non-discriminatory and persistent and cannot catch live birds. Their effects on all biodiversity, such as soil fauna, are great. Its use needs to stop to ensure the survival of all species in the park. I recommend that the patrols continue, to ensure that hunting with poison is halted. Going into villages and asking questions about hunting birds may have scared off most hunters.

The discovery that there is hunting taking place in both maize and rice fields adds a new dimension to the threat facing the lovebirds. Hunting in the fields means that hunting is an activity taking place for most of the year (March-November). If the hunting is serious in the fields it could be a greater threat to Lilian's Lovebird than hunting inside the park. Since the birds are spending more time outside the park this puts them at greater risk. Breeding and hunting in the fields take place at the same season which might be devastating for recruitment and population viability.

The community perceive the lovebirds to be a major pest by destroying maize crops. This needs to be investigated to establish if the claim is true or false. While hunting in the park could be resolved by a simple action such as stronger law enforcement, hunting in fields cannot be so easily negated.

## **CONCLUSION**

There is still so much more that needs to be done to better understand the viability of the Lilian's Lovebirds in Liwonde National Park. This study has helped to bring to light several important issues to be investigated further. The fact that the population numbers are above the earlier estimates is good news. The habitat and breeding sites are common / abundant and thus the population should be able to expand if hunting is prevented. Hunting surely has an impact on these birds, but with the present data it is not possible to determine just how big the impact is. The discovery of hunting in agriculture fields that specifically targets Lilian's Lovebirds is a serious concern. This hunting could be more detrimental than that done in the park and will be further investigated. Due to the many new questions this study has raised there is needed to seek more financial assistance to undertake this work. The park staff will also assist in collecting relevant information as stated in the conservation and recommendation section.

## **CONSERVATION RECOMMENDATIONS**

Actions for ongoing work:

Environmental Education – In many of the communities visited, few people knew how special the Lilian's Lovebird is to Liwonde, Malawi and the world. We must inform and sensitise the CBOs, Wildlife clubs and Village Natural Resource Committees (VNRCs) around the park about this lovebird and how it is threatened by hunting (and poisoning).

Monitoring – the current research monitoring in the park is solely focused on large mammals but it should incorporate Lilian's Lovebird. A separate sheet (see Appendix 5) should be used by the research and law enforcement teams during their patrols and annual counts.

Equipment – all of the camps should have at least one working GPS when on patrol. This would produce a more accurate map of the lovebird's distribution in the park and identify exactly where old and new hunting places are located.

## ACKNOWLEDGEMENTS

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### Cover Photos

Lillian lovebirds drinking point (waterhole 3, rhino sanctuary)

Photo by Dirk Van der Abeele

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## APPENDICES

### APPENDIX 1: Potential follow-up research

The current project has achieved most of the preliminary aims, however it has also raised a lot of new questions that need to be investigated. These include

1. Breeding ecology – Breeding sites have been identified but more could be located. Questions include; When does breeding behaviour commence? Where in the park are the main breeding sites? What are some of the habitat characteristics? When does laying of the first egg occur? How many eggs are laid? Breeding success? Characteristics of the nest hole (orientation, tree type, cavity depth)? etc

2. Feeding ecology – what are the main food sources? Does food availability and preference change at different times of the year? How much of the diet consists of *Acacia xanthophloea* and *Adansonia digitata* flowers? Do species compete for the food resources? Why do some lovebirds go to feed across the river or at Lake Chilwa? Is this movement year round or seasonal?

3. Movements – from the 2010 observations, there appears to be a local migration of the lovebirds to different areas. A few individual lovebirds will be fitted with a small transmitter to monitor movement within and outside the park. Investigations to be made in areas of reported seasonal sightings.

4. Agriculture Pests – investigate the damage caused in surrounding fields by the lovebirds. How do different communities protect their crops? Any conservation threats?

5. Prevalence of PBFV and other parasites - blood samples will be collected to test for Parrot Beak and Feather disease. Collection of nest parasites and ectoparasites, will also be collected from the samples collected by the Museum of Malawi.

6. Other smaller aspects will be incorporated into the project. These include investigating moulting patterns and monitoring nest temperatures with i-buttons

The ecology of *Agapornis lilianae* has never been studied in the wild. This project will investigate key aspects of its ecology to determine its presence in LNP and Malawi. It will be a flagship species to be used in future conservation plans. A similar study was done on the Black-cheeked Lovebird in Zambia, allowing for comparison of the ecology of the two species. The data obtained during the pilot project provides an excellent starting point for this future work

## APPENDIX 2: List of hunted birds

English name	Chewa/yao name	No. Of times mentioned
Tawny-flanked Prinia	Timba	12
Black eyed bulbul	Pumbwa	9
Doves	Njiwa	21
Yellow fronted seedeater	Chingolopiyo	7
(not yet known)	Kambwiri	0
Francolin	Nkhwali	13
Spur winged goose	Senkhwe	2
Quails	Njitenjite	11
(not yet known)	blue kanjesi	1
Parrots	Chinkhwe	5
Blue waxbill	Kasisi	10
Helmeted Guinea fowls	Nkha,nga	8
Blue waxbill	Sisisi	5
Weavers/Quelea	Mpheta	12
(not yet known)	Akanjire	2
(not yet known)	Katiti	2
(not yet known)	Phwiti	2
Manikins	Pingo	5
Quails	Ziziri	1

### APPENDIX 3: Objective evaluation

Objective	Achieved/Not
<ul style="list-style-type: none"> <li>To estimate the population size of the lovebirds in LNP</li> </ul>	Achieved – a minimum population of 2,000 individuals estimated
<ul style="list-style-type: none"> <li>To map its distribution in LNP</li> </ul>	Achieved – Figure 6
<ul style="list-style-type: none"> <li>To evaluate its current Malawian Red Data Book status</li> </ul>	Not achieved – new threat from hunting in fields need to be assessed
<ul style="list-style-type: none"> <li>To plan future monitoring and conservation management.</li> </ul>	Achieved – suggestions presented in recommendations section
<ul style="list-style-type: none"> <li>To study the habitat preferences, diet, breeding biology and local movements of the birds.</li> </ul>	Partially done
<ul style="list-style-type: none"> <li>How many hunters are there in the local communities?</li> </ul>	More time needed to determine this
<ul style="list-style-type: none"> <li>Is it a full time practice or only occasional activity in the dry season”?</li> </ul>	Achieved – hunting in park seasonal
<ul style="list-style-type: none"> <li>How much live trade is taking place in Lillian’s Lovebirds?</li> </ul>	Achieved – No live trade taking place
<ul style="list-style-type: none"> <li>Are these subsistence or commercial hunting practices?</li> </ul>	Achieved – hunting is for both subsistence and commercial

## **APPENDIX 4: Other achievements**

1. 4,600 leaflets printed - The project was fortunate to get the support of Shire Lodge and Hippo View lodge who operate close to Liwonde National Park. They have helped to fund the production of a small leaflet that allows visitors to the park to participate in this study. This leaflet (attached separately) will help to collect data till after the current project is completed.
2. Two IBA signposts erected
3. Four Students Participate – Students approached to participate were very keen to assist with the field work. . Thus four instead of two participated, representing Bunda and Chacellor Colleges of the University of Malawi.
4. Wire snare removal - During the transect walks 15 wire snares were removed in different places in the park. One of the team actually got caught in one at Mpwapwata Camp.
5. A complete bird list of all bird species encountered during this project is being kept. This will provide information on the status of other species in the Park
6. Lion sighting – after several years of speculation that lions had left Liwonde National Park, the research team encountered a lion during one of the roost watches on 31 October 2010. Photos were taken, and the park management was very pleased



