

SUMMARY REPORT

Assessment of the Zambian Barbet for Red Listing Purposes

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1. SUMMARY

The Zambian barbet is confined to the Southern and Central provinces of Zambia, and is Zambia's only endemic bird species. The 2004 IUCN Red List Category for Zambian barbet is Near Threatened, but their current status, and distribution were poorly known.

Therefore systematic surveys of this species were begun in 2006, in three regions: 1) the Kafue Flats and adjacent areas, 2) Kafue National Park (KNP), and 3) the eastern part of their range. During the surveys, I drove along roads and tracks, and collected data on habitat suitability for Zambian barbets at approximately 5 km intervals. I visited sites in 23 of the 28 quarter degree squares where barbets were historically seen. Sites were classified as suitable depending on the tree species composition and presence of sycamore fig trees, upon which Zambian barbets are highly dependent. I determined the habitat suitability of 397 sites.

I searched for barbets in areas of suitable habitat by using playback of their calls and the calls of black-collared barbets. These two barbet species react to each others calls in regions where their distribution overlaps. Playback was used to determine the occupancy of sites, as well as to determine the response rate to calls, or the detection probability. Detection probability was used to correct estimates of occupancy, as it is less than 100% and occupancy would thus be underestimated.

The majority of the barbet population is found outside of protected areas. Here suitable habitat for barbets is likely to face threats from agricultural land clearing and fuelwood collection. Therefore, apart from assessing the status of the species, I also recorded the threats that the habitat faces.

Zambian barbets were found in 10 of the 23 quarter degree squares that were visited, and therefore only in 43% of historically occupied squares. Detection probability was 80%, and therefore barbets are likely to occur in 54% of squares in reality. Nevertheless this represents a 46% reduction in the occupied grid squares. Zambian barbets were found in 11 of 77 sites surveyed.

None were found in Kafue or Blue Lagoon National Parks. Of the sites surveyed for vegetation, 10% of these contained suitable habitat.

The results of this survey indicate that suitable habitat for Zambian barbet is being degraded by both fuel-wood collection and by commercial agriculture, and that their distribution and abundance have declined within the past 20-30 years. Large trees are usually left in small-scale agricultural fields. However, dead branches on these trees, which are used as nesting sites by the barbets, were extensively cut for fuel-wood, making the persistence of this species within this type of land-use system doubtful. Particularly in the east of the range, some suitable habitat has been destroyed by the spread of urban areas.

The population size of the species was estimated as 2587, with an area of occupancy of 1300 km². An assessment of the IUCN criteria indicates that Zambian barbets qualify for Vulnerable. Therefore, I have submitted a proposal to BirdLife International, who is the red-listing authority for birds, to recommend changing the status of Zambian barbet from Near-Threatened to Vulnerable during their current re-evaluation of the status of all birds for the 2008 Red List.

The data collected in this survey will be used to analyse satellite imagery to estimate the amount of suitable habitat that remains for the Zambian barbet within Zambia, and to pinpoint areas that would be fruitful to search for occupancy. The estimates of population size need to be refined, as Zambian barbets may actually meet the criteria for Endangered, and more data will need to be collected, especially on subpopulation structure.

On the basis of this survey, and due to an appeal to BirdLife International, the name of this species has been changed from Chaplin's barbet to the Zambian Barbet. The fact that many people did not know this species at all, and that it is one of only two Zambian endemic bird species, emphasizes the need for a publicity campaign, to inform people of its existence, of its name change, and, importantly, to involve them in its conservation.

2. INTRODUCTION AND OBJECTIVES

Zambian (Chaplin's) barbet (*Lybius chaplini*) is confined to the Southern and Central provinces of Zambia, and is Zambia's only endemic bird. The 2004 IUCN Red List Category for Zambian barbet is Near Threatened, and field surveys to establish their true status, distribution and ecological requirements were considered a priority by BirdLife International. They are highly dependent on sycamore fig trees (*Ficus sycamorus*), the density of which may limit the barbets' population size, both in terms of nest availability and a year-round supply of fruits.

Zambian barbets are known to occur in three IBAs within Zambia, namely Chisamba, Nkanga River Conservation Area (NRCA) and Kafue Flats. These areas are largely unprotected except for Blue Lagoon National Park on the Kafue Flats, where they are occasionally seen, and NRCA, which is partially protected. However, their presence in Blue Lagoon National Park is irregular and population sizes are unlikely to be viable. Historical sightings have also been recorded in Kafue National Park, but the last confirmed sightings of Zambian barbet within the park were in 1980s. The status of this species countrywide was uncertain.

It was therefore imperative that their status in 3 main regions was known: 1) the Kafue Flats and adjacent areas, 2) Kafue National Park (KNP), and 3) the eastern part of their range. The reasoning behind this was that 1) the Kafue Flats forms the central core of their range and is the area from which sightings are most commonly reported; 2) KNP is a vast protected area of 2.24 million ha, and whether a population of barbets exists in this area may be vital for the conservation of this species; and 3) the eastern region is the most heavily populated and most highly impacted part of their range, and the greatest changes in their distribution can be expected to occur in this region.

The majority of the barbet population is probably found outside of protected areas. Here suitable habitat for barbets is likely to face threats from agricultural land clearing and fuelwood collection. Therefore, apart from assessing the status of the species, I also recorded the threats that the habitat faces.

Systematic surveys of this species were begun in 2006. The objectives of these surveys were 1) to determine the status of Zambian barbets within the Kafue National Park (KNP) IBA, Kafue Flats and the east of their range, 2) to determine the extent of suitable habitat within Zambia, 3) to use the results of these surveys to estimate population size, and 4) to update the red listing status of Zambian barbet.

3. METHODOLOGY

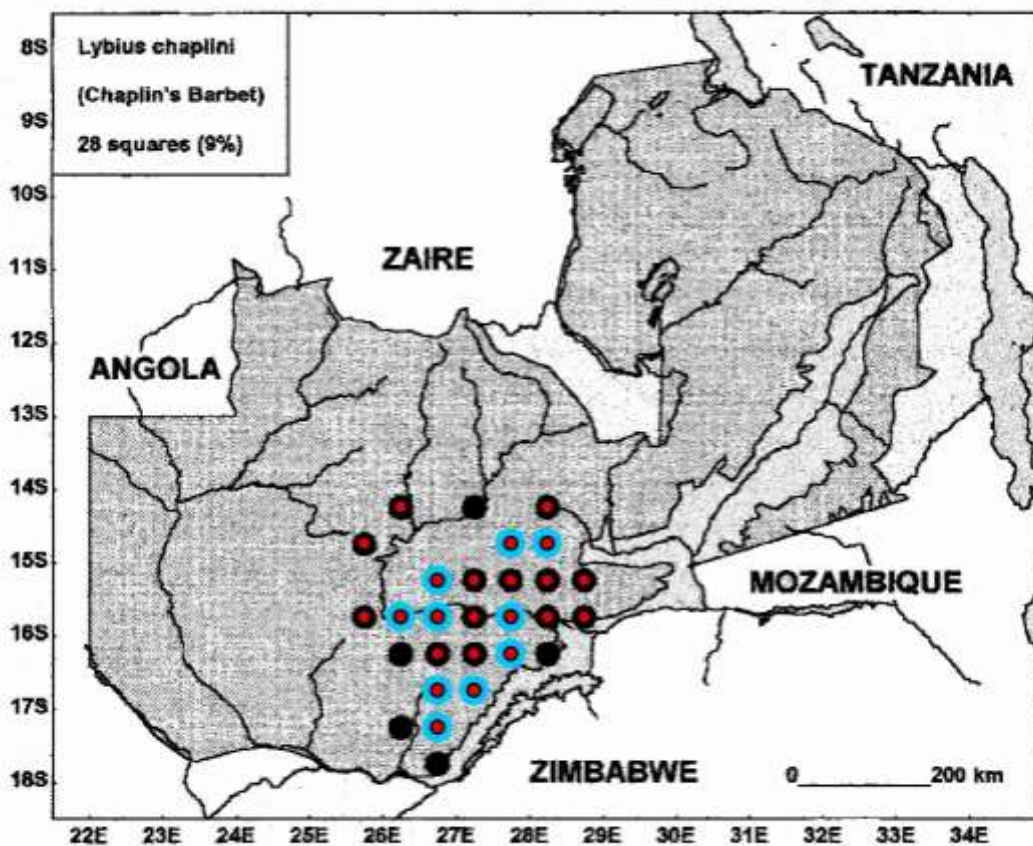
The surveys were conducted between June 2006 and September 2007. Table 1 lists the quarter degree squares visited. Information was collected on suitability of vegetation for *Zambian barbets*, response rate and occupancy of sites by *Zambian* and *black-collared barbets*, and threats to sites. Figure 1 shows the quarter degree squares visited.

Table 1. Quarter degree squares in Zambia where *Zambian barbets* were historically recorded, which sites were searched, and where barbets were detected.

Quarter Degree Square	Name of square/ site within square	Searched	Detected	Year
1415 S 2615 E	Moshi and Ntemwa	Yes	No	2007
1415 S 2715 E	Chilenga	No		
1415 S 2815 E	Kabwe	Yes	No	2007
1445 S 2545 E	Kafue Hook, KNP	Yes	No	2007
1445 S 2745 E	Keembe	Yes	Yes	2007
1445 S 2815 E	Lemba and Landless Corner	Yes	Yes	2006/2007
1515 S 2645 E	Nansenga	Yes	Yes	2006
1515 S 2715 E	Blue Lagoon National Park	Yes	No	2006
1515 S 2745 E	Mwembeshi	Yes	No	2006
1515 S 2815 E	Airport, Lusaka	Yes	No	2007
1515 S 2845 E	Chalimbana	Yes	No	2007
1545 S 2545 E	Musa River	Yes	No	2006
1545 S 2615 E	Itezhi-tezhi, Namwala	Yes	Yes	2007
1545 S 2645 E	Maala	Yes	Yes	2006
1545 S 2715 E	Banakaila	Yes	No	2006
1545 S 2745 E	Mazabuka	Yes	Yes	2006
1545 S 2815 E	Kafue	Yes	No	2007
1545 S 2845 E	Leopard's Hill Road	Yes	No	2007
1615 S 2615 E	Nanzhila	No		
1615 S 2645 E	Mapanza	Yes	No	2006
1615 S 2715 E	Bwengwa	Yes	No	2006
1615 S 2745 E	Moorings campsite	Yes	Yes	2006
1615 S 2815 E	Chikankata	No		
1645 S 2645 E	Sibanyati	Yes	Yes	2007
1645 S 2715 E	NRCA	Yes	Yes	2007
1715 S 2615 E	Kalomo	No		
1715 S 2645 E	Kalomo Rural	Yes	Yes	2005*
1745 S 2645 E	Kabenga Mission	No		
Proportion searched:		23/28 (82%)	Found: 10/23 (43%)	

* Species detected incidentally, and not during these surveys

Figure 1. The map shows the quarter degree squares where Zambian barbets have been recorded in the past (modified from a map by Bob Dowsett, from the Bird Atlas of Zambia (in press)). Black dots indicate that the grid square was not surveyed; red dots indicate that the grid square was surveyed, but no barbets were found, and blue and red dots indicate that barbets were found during a survey.



1. Vegetation survey

During the survey, we drove along roads and tracks, and stopped every 5kms to collect information on the habitat. Habitat was classified as suitable if it contained large sycamore fig trees, or large specimens of other species of fig, had a relatively low overall density of trees, and contained a combination of species characteristic of acacia woodland, such as *Acacia sieberana*, *Acacia polyacantha*, *Piliostigma thonningii*, *Faidherbia albida*, *Ziziphus abyssinica*, and *Azanza garckeana*. Denser woodland types, such as miombo (*Brachystegia*) woodland and thicket were classified as unsuitable, as were intensely modified agricultural land (where crops were dominant and trees were removed from the landscape), and pure grassland or grassland with small stunted trees. Sometimes the habitat contained some suitable elements, but it was either heavily modified in some way, or did not contain large fig trees. This habitat was then classified as marginally suitable. It was included in the non-suitable category for the analysis, but is habitat that has the potential to be suitable, if it is restored.

2. Barbet survey

If I encountered habitat that appeared suitable for *Zambian barbet*, i.e., open acacia savanna with fig trees, I played their call, followed after 5 minutes by the call of black-collared barbets. I noted the response of both barbet species to these calls. Sometimes the sampling sites overlapped with vegetation sampling sites, but sometimes they did not. In some sites, chosen randomly, I duplicated this procedure to obtain data for calculating detection probabilities for both *Zambian* and black-collared barbets. The second sample was taken within 24 hours of the first. Black-collared barbets were included in the sampling as they are common and ubiquitous, and are known to respond to the calls of *Zambian barbet* where they overlap in distribution (pers. obs.).

3. Population size estimates

The population size of *Zambian barbets* was estimated using 3 parameters:

- a) Area of suitable habitat (A)
- b) Size of territory (T)
- c) Occupancy of suitable habitat (O);

and was calculated as $\text{Number of Birds} = (A \cdot O) / T \cdot 2$

- a) Area of suitable habitat

This was based on the number of sites that contained suitable habitat. I calculated the average and standard error using the number of suitable sites per quarter degree square. The proportion of suitable habitat for their range is $8.7 \pm$

2.2 %. The area of suitable habitat was calculated as the area of 28 quarter degree squares (8 261 000 ha) multiplied by the proportion of suitable habitat.

b) Size of territory

Territory size was assumed to be 100 ha, based on data collected from the NRCA IBA. Here 8 groups of birds occupy an area of approximately 2100 ha. The entire area is not suitable habitat, and approximately half of the area is used by the barbets. As I do not have exact territory sizes calculated for each group, and therefore cannot calculate a standard error, I estimated it as 30 ha.

c) Occupancy of suitable habitat

Based on the barbet survey, occupancy of sites was 14%. I calculated the detection probability using the programme Presence v. 2, which is based on models by Mackenzie et al. (2002). I used a single-season single-species model. The number of samples was 28, with two replicates. Detection probability was 0.80 ± 0.19 . I therefore corrected the occupancy using the detection probability, and obtained a corrected occupancy of 18%.

4. Threats to habitat

The overall assessment of current threats to habitat was not done quantitatively. This was frequently difficult to assess as Zambian barbets do occur in slightly modified habitats (land used for grazing or small-scale fields where trees are left in fields).

However, I did measure the extent of cutting of dead branches in sycamore fig trees in two regions: small-scale agriculture in the Blue Lagoon National Park area (15°25'S 27°20'E), and the NRCA conservancy in Choma District (16°37'S 27°02'E). The trunk circumference of trees was measured, and the number of cut branches and the amount of dead wood (estimated as the number of dead branches with a diameter of more than 5 cm) estimated.

4. RESULTS

1. Vegetation survey

Of the 397 sites assessed for vegetation, 41 were suitable for Zambian barbets. The remaining 356 sites were unsuitable (Table 2), of which 73 were marginally suitable. Vegetation sampling sites are shown in Figure 2.

Figure 2. Map of central Zambia showing vegetation sampling points (in green), and barbet sampling points (in black, where Zambian barbets were not found, and in red, where Zambian barbets were found). Map Source: Section of 1:1 500 000 map of Zambia, Ministry of Lands, Government of Zambia, 1986.

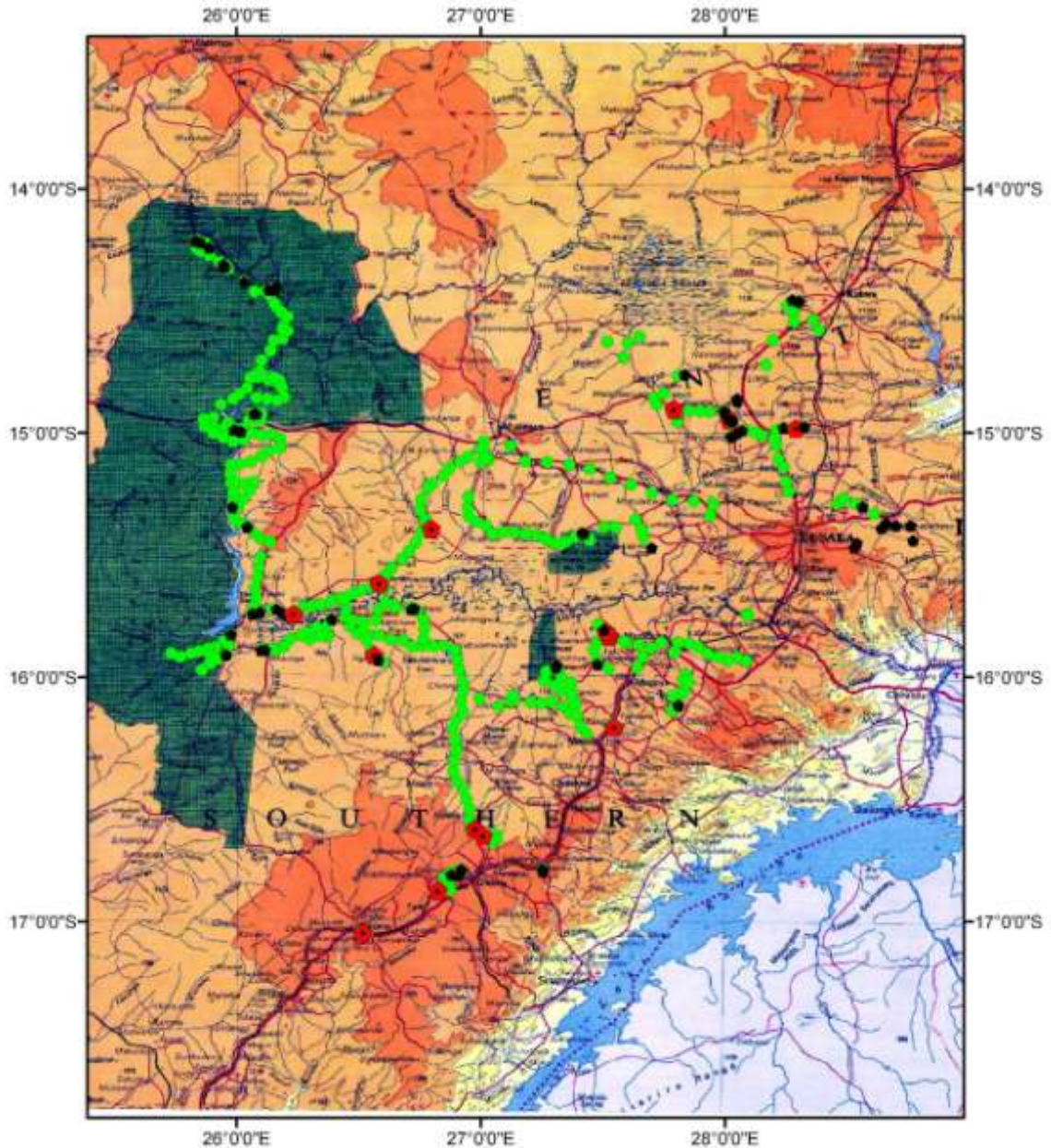


Table 2. Results of the barbet and vegetation survey.

Survey	Total no. of sites	Unoccupied Sites	Occupied Sites
Zambian barbet	77	66	11 (14%)
Black-collared barbet	55	17	38 (69%)
		Unsuitable sites	Suitable sites
Vegetation	397	356 (90%) Of which 73 were 'marginally suitable'	41 (10%)

2. Barbet Survey

I detected *Zambian barbets* in 14% of the 77 sites that were surveyed (Table 2). In contrast, *black-collared barbets* were detected in 69% of sites. Barbet sampling sites are shown in Figure 2.

I did not find any *Zambian barbets* within Kafue National Park. Notably, in the surveys of KNP and the adjacent Game Management areas, in 21 of these sites, I had no response from either *black-collared barbets* or *Zambian barbet* to the call of *Zambian barbet*. This implies that *black-collared barbets* were unfamiliar with the call of *Zambian barbets* and it confirms that these areas are unoccupied by *Zambian barbets*. In two sites, *black-collared barbets* responded to the call of *Zambian barbet*. These last 2 responses both occurred in the Itezhi-tezhi square, where, in one site, *Zambian barbets* responded to playback of their own call, and were thus resident in this area.

Zambian barbets were found in 11 sites in 10 of 23 quarter degree squares that were surveyed. This is only 43% of squares. Correcting for detection probability, which was 80%, this implies that in reality 54% of the quarter degree squares are still occupied. This represents a decline in occupancy of 46% in the past 20-30 years.

Two caveats need to be added to this estimate. Firstly, to include some of the peripheral squares as 'occupied' may be overestimating the range extent of *Zambian barbets*. In several of these sites, for example, the Kafue National Park sites, barbets were rarely seen in the past, and it is debatable whether they represented sites that actually held resident populations of barbets, rather than dispersing individuals. Thus historical range or occupancy may be overestimated by these peripheral sightings.

Secondly, visiting sites that were historically occupied represents a biased sample of sites. These are likely to be sites that were most often frequented by people and may be close to roads, settlements, farms and other infrastructure. Thus, they are also likely to be the sites that are most impacted by humans today, and may represent the worst case scenario in terms of declines in occupancy. On the other hand, when estimating the population size, they also represent a biased sample, in that one is not sampling randomly and may thus overestimate occupancy and thus population size.

Nevertheless, a decline in occupancy has occurred. In some sites this is certain. For example, sites that now occur within the towns of Mazabuka and Lusaka are completely transformed, but were rural in the past, and had resident *Zambian barbets*. In other sites, it may be that I was not able to detect the species although it is present.

3. Population size

Using the average estimates for the 3 parameters, population size for *Zambian barbets* is estimated at 2587 reproductive adults (Table 3). The upper and lower estimates of population size, when varying the parameters individually, are shown in Table 3. Based on the proportion of suitable habitat and the occupancy, the area of occupancy is 1 300 km².

Table 3. Estimates of population size (number of reproductive adults)

Parameter	Lower	Average	Upper
Suitable Habitat (0.087 ± 0.022)	1933	2587	3242
Territory size (100 ± 30 ha)	1990	2587	3696
Detection probability (0.80 ± 0.19)	2012	2587	3450

4. Threats to habitat

Suitable habitat is being destroyed by commercial cropping and urbanization, and is being degraded by fuel-wood collection and small-scale agriculture. Commercial agriculture occurs mostly around the centres of Mazabuka, Lusaka, Kafue and Chisamba, while in most other areas agriculture is small-scale. Large trees are usually left in small-scale agricultural fields. However, I found that these trees were usually extensively cut for fuel-wood. This is a widespread problem affecting barbets around the edges of the Kafue Flats. I measured the dead wood availability of *Ficus sycamorus* trees in and around agricultural fields and villages in the Blue Lagoon area. These dead

branches serve as nesting sites for Zambian barbets. There was a significantly greater number of cut branches in these areas (5.3 ± 0.6 cut branches per tree, $n = 44$), compared with trees within the conservancy, the NRCA (0.04 ± 0.03 cut branches per tree, $n = 78$). There was therefore a reduction in the amount of dead wood available for nesting sites for hole-nesting birds.

Zambian barbets were found in small-scale agricultural fields in one region (Mazabuka District, $15^{\circ}50'S$ $27^{\circ}32'E$), but this area may have been an exception. The chief in the area, Chief Mwanachingwala, had banned the production of charcoal in his chiefdom. Charcoal is exported from the rural areas to the urban centres in Zambia. This can lead to a shortage of preferred fuelwood trees in rural communities, who then rely on less suitable species, such as *Ficus*. In this chiefdom, preferred fuelwood species were most likely still present and cutting of dead branches off *Ficus* for fuelwood was minimal.

Around Kafue, Mazabuka, Chisamba and Lusaka, suitable habitat has been destroyed by commercial agriculture, but also by the spread of urban areas. Zambian barbets occurred in sites that were historically near to both Kafue and Mazabuka towns. These sites are now within the urban areas and all suitable habitat has been destroyed, with a few remnant fig trees remaining to indicate the former suitability of the habitat. Commercial ranching is usually not a problem and Zambian barbets are found on a few commercial cattle ranches (e.g., Mubanga Farm in Chisamba District). However it is essential that large trees are left in pastures, and that the habitat is not allowed to become encroached with invasive species, such as *Lantana*, or with native species such as *Dichrostachys cinerea*. Commercial cropping, mostly of maize, is totally destructive of suitable habitat.

5. ASSESSMENT OF RED LIST CRITERIA

From the results above, Zambian barbets have

- a) A population size of 2587 (< 10 000)
- b) A decline in occupancy/ extent of occurrence of 46% in 20-30 years
- c) An area of occupancy of 1 300 km² (< 2000 km²).

The population structure should ideally be one of the parameters determined for the red list assessment. This was not specifically done in these surveys and would require additional information. However, the map in Figure 2 suggests that there are four clusterings of sightings that may be interpreted as sub-populations. These are:

- 1) Choma - Kalomo, in the south-west
- 2) Mazabuka - Monze, in the south-east
- 3) Itezhi-tezhi - Nansenga, in the north-west
- 4) Chisamba - Keembe, in the north-east

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria (A to E), and it is therefore considered to be facing a high risk of extinction in the wild.

Zambian barbets meet the following IUCN Red List criteria for VULNERABLE:

B2. Geographic range in the form of Area of Occupancy estimated to be less than 2000 km², and estimates indicating that:

- a. Severely fragmented or known to exist at no more than 10 locations.
- b. Continuing decline, observed, inferred or projected, in any of the following:
 - (i) extent of occurrence
 - (ii) area of occupancy
 - (iii) area, extent and/or quality of habitat
 - (iv) number of locations or subpopulations
 - (v) number of mature individuals.

C1. Population size estimated to number fewer than 10,000 mature individuals and an estimated continuing decline of at least 10% within 10 years or three generations, whichever is longer, (up to a maximum of 100 years in the future)

C2. Population size estimated to number fewer than 10,000 mature individuals and a continuing decline, observed, projected, or inferred, in numbers of mature individuals and no subpopulation estimated to contain more than 1000 mature individuals.

6. DISCUSSION AND CONCLUSIONS

The results of this survey indicate that suitable habitat for Zambian barbet is being degraded by both fuel-wood collection and by commercial agriculture, and therefore that their distribution and abundance have declined within the past 20-30 years. Particularly in the east of their range, suitable habitat has also been destroyed by the spread of urban areas.

Consequently, Zambian barbets meet the IUCN Red List criteria for Vulnerable. I have therefore submitted a proposal to BirdLife International, who is the red-listing authority for birds, to recommend changing their status from Near-Threatened to Vulnerable during the current re-evaluation of the red-listing status of all birds for the 2008 list. A more detailed analysis of the four sub-populations in future may reveal that their population sizes are even smaller, and they may in fact meet the criteria for Endangered. Visiting sites of historically known occupancy will have led to an overestimate of population size in this report.

On the basis of these surveys, and due to an appeal to BirdLife International, the name of this species has been changed from Chaplin's barbet to the Zambian Barbet. Sir Drummond Chaplin, after whom the bird was named, was a colonial governor of the former colonies of southern and northern Rhodesia (now Zimbabwe and Zambia respectively) from 1914 to 1923. Zambian barbets are not well known in Zambia, and do not occur in any significant numbers in any national park. The conservation of the species would therefore be highly dependent on the actions of individual farmers and land owners. They are unlikely to be persuaded to put effort into conserving habitat for a bird that is named after a former colonial governor.

There is no resident population of Zambian barbets within Kafue National Park, although there are, or at least were in the past, occasional sightings of this species within the park boundary. As this large area can be excluded from their resident range, the estimates of population size have been severely reduced. Zambian barbets were also not found in Blue Lagoon National Park. I have not seen them in this park since 2001, and have heard no other reports of them since, although suitable habitat exists at a lodge that is visited regularly by bird-watchers. The only protected area that they are known to be resident in is Nkanga River Conservation Area, a conservancy in the Choma District of southern province. This contains a population of at least 20 birds. However, this is hardly a viable population and action will be needed in the near future to prevent its extinction, in this and in other areas of its range.

7. RECOMMENDATIONS FOR FURTHER WORK

- a) A more detailed analysis of the existence and sizes of subpopulations. The largest gap in the surveys exists in the area to the West of the Lukanga swamps and in Mumbwa district. My estimates of population size are likely to be too large, as indicated in the discussion, and this species may in fact qualify for Endangered.
- b) Analysis, using satellite imagery, of the extent of suitable habitat in the species' entire range
- c) A public awareness campaign on the renaming of the species, its new red list status and measures that can be undertaken to ensure its conservation
- d) The production of a conservation action plan for this species
- e) A population and habitat viability assessment

8. ACKNOWLEDGEMENTS

Thank you to the RSPB, Cleveland Metroparks Zoo and the African Bird Club for providing funding through their various small grants programs to carry out these surveys. Without the funding this would not have been possible and we would still have been complacent about the status of Zambian barbets.

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