Population status and distribution of Hinde's Babbler (*Turdoides hindei*) in Meru national park and Ngaya Forest Reserve areas of Meru county, Kenya

Onyancha F.M [1]*, Eshiamwata G. W [1], Karanja H. T [1], Njoroge P [2]

[1] *Natural Resource Department, Egerton University P.O Box 536-20 15, Egerton*
[2] *Ornithological Section, National Museum of Kenya, P.O. Box 40658 – 00100, Nairobi*
*Corresponding author E-mail: onyanchafm@gmail.com

Abstract

Hinde's Babbler which is listed as Vulnerable in the IUCN Red List with isolated populations confined to some parts of central and eastern Kenya. A survey was conducted between June and December, 2015 to assess and compare population status of Hinde's Babbler across a gradient of levels of protection. Data was collected at intervals of 100m along predetermined cumulative 19 km transects where playback of Hinde's Babbler was used to elicit response of individual groups. At each point of detection, total number of adults, offsprings and vegetation phenology was recorded. The entire habitat population was 540 individuals (dry season; Ngaya FR-255, Meru NP-137 and Agricultural landscape- 148), 411 individuals (wet season; Ngaya FR-168, Meru NP-185 and Agricultural landscape- 58) though there was no significant statistical difference between the seasonal datasets. There was significance difference between adults and juveniles in both seasons (Mann Whitney, Dry P= 0.0001 and wet season, P = 0.0002). These results imply that the three sites are vital for the survival, conservation and management of this threatened species and hence continuous monitoring of protected and unprotected sites is necessary for conservation of threatened avian species like Hinde's Babbler.

Keywords: *Hinde's Babbler; Ngaya; Protection Gradient; Population Status; Threatened Species.*

1. Introduction

Hinde's Babbler is listed as Vulnerable on the IUCN RedList since it is known from a small number of locations within a small range, where its habitat is undergoing severe fragmentation (Collar et al., 2016; Collar & Stuart, 1985). Their distribution has been linked with river valleys, woodlands and swamps, and to the presence of dense thicket vegetation (Ghazoul et al., 2013). Though some studies indicate that many species of this family have widened their range to other ecological zones (Njoroge & Bennun, 2000). This shows that members of Timaliidae family are not sedentary to ecosystems but can adopt to any ecological conditions (BirdLife, International, 2014b).

The Hinde's babbler population was initially believed to be between 1000-3700 mature individuals with a decreasing trend because of perceived habitat fragmentation within its range (BirdLife International, 2012). Its endemic to parts of Central and Eastern Kenya, (Bennun et al., 1996). Its conservation within a severely modified agricultural landscape is a substantial challenge than it seems in to policy makers(Njoroge & Bennun, 2000). Though these efforts seem not combative since the rate of population is very low, an increase of +1.3. The known strongholds for this species include the unprotected sites such as Mukurweini, Kianyaga and part of Machakos (Bennun & Njoroge, 1999). It is highly sedentary and occurs in groups of individuals all year-round (Njoroge & Bennun, 2000). Though surveys have been undertaken within its known

range Hinde's Babbler's population remain unknown in Meru National Pak, Ngaya Forest Reserve and the adjacent environs. The purpose of this study was to survey these less known sites with a view of documenting the population status and distribution.

2. Materials and methods

The study was conducted in Ngaya Forest Reserve 0°22'0" N and 38°1'60" E, Meru National Park and its adjacent agricultural landscape comprising of Murera Springs and Kiruyu 38^0 25`E, 00 10`S. Meru National Park covers an area of 87,000 ha and stands at altitude range of 370–910 m with area co-ordinates of 380 25`E and 00 10`S. The Park is under the management of Kenya Wildlife Service (KWS). Meru National Park and its adjacent environs is crisscrossed by thirteen permanent rivers and numerous streams, draining from the Nyambene Hills and Ngaya Forest Reserve. The wetter north-western sector (rainfall 700 mm/year) is hilly, with rich volcanic soils (Bennun & Njoroge, 1999).

Ngaya Forest Reserve one of the few remaining stands of indigenous equatorial forest in Kenya and it elevation of 1,249 metres above sea level (Torello-Raventos et al., 2013). The reserve falls under the jurisdiction of the Kenya Forest Service and under Community Trust. It covers an area of 75,000 ha, though it has been encroached and is covered by Lantana camara which is invasive. The Ngaya area experiences bimodal rains with long rains in March and May and short rains occur between October and December. The average rainfall received in a year is 1300mm in the highlands and 380mm in the low-lying areas towards eastern sides of the park (
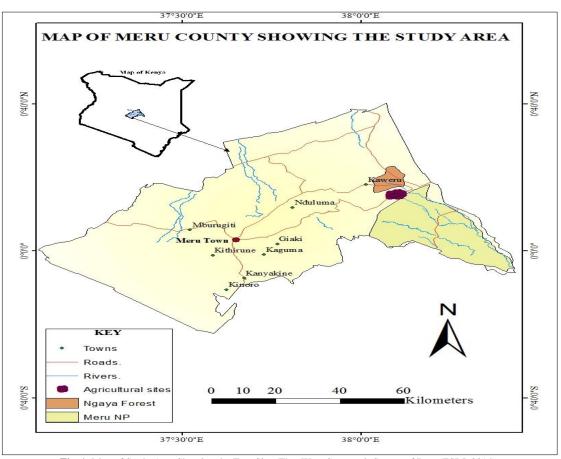
Fig. **1**).

Fig. 1: Map of Study Area Showing the Two Sites That Were Surveyed (Source of Data, ESRI, 2014).

Surveys were conducted during the months of June-December 2016. An ecological survey design was used where transects measuring 600m long by 100m wide were laid purposively covering distance of 19km with data collected at intervals of 100m. Survey in all study sites was conducted between 0600hrs and 1800hrs. Hinde's Babbler are very skulky but highly territorial and aggressively react to playback tape (Shaw et al., 2001). A playback of Hinde's Babbler was played at beginning of transects then after every 100m to elicit the response of babblers. At each point, the playback was played for 1-2min and if sighted, the group were observed for 10mins. This was to provide enough time to accurately estimate the group size, juveniles, the map the vegetation. It was assumed that other groups did not rejoin other territories with the 100m meet interval. This interval took into account the territory size of Hinde's Babbler which is 50m x 50m. Individuals were classified as adults and offsprings. For aging purposes the best characteristic that was used is the eye-colour as described in Shaw et al. (2001) and Zimmerman et al. (1999).

The population was estimated by extrapolation of the sample results to the entire habitat results using the equation:

$$P = \left(\frac{n}{a}\right) \times A$$

Where; P = Population estimate of the entire habitat
n = Number of Hinde's Babblers sighted during the survey
a = area surveyed (transect length * transect width) (km^2)
A= Potential geographical area of occurrence (km^2)

During the dry season surveys (July-August, 2015), Hinde's Babblers were detected at much lower densities at Meru National Park (13.69 birds/area) than at Ngaya Forest Reserve (36.72 birds/area) and agricultural sites (36.90 birds/area). Agricultural sites had the highest density of groups while MNP had the lowest (

Table **1**). There was significant statistical difference between the population of adults and offsprings (Mann Whitney, P = 0.0001).

In contrast, wet season survey (October -November, 2015) recorded a much higher mean group size with 5.2 individuals per group in Ngaya Forest, 4.0 individuals/group at agricultural sites and 3.9 in Meru National Park. In terms of densities, it was highest in Ngaya Forest Reserve (24.22 Birds/area) and lowest in the agricultural sites (14.29 Birds/area) (

Table **1**). There was significant statistical difference between the population of adults and offsprings (Mann Whitney, P = 0.0002)

Table 1: Hinde's Babbler Seasonal Population Status across Protection Gradient

	Season	Mean group size	Birds/ area	Groups/ area	% off-springs
Ngaya Forest Reserve	Dry	4.7	36.72	7.81	8.5
	Wet	5.2	24.22	4.69	6.5
Meru NP	Dry	4.6	13.69	2.98	8.7
	Wet	3.9	18.45	4.76	9.7
Agricultural Sites	Dry	3.4	36.90	10.71	9.7
	Wet	4.0	14.29	3.57	0

The protected landscapes of Meru National Park and Ngaya Forest Reserve had more individuals of Hinde's Babbler in comparison to the unprotected agricultural landscapes. The population of Hinde's Babblers during the survey was 540 Hinde's Babblers during the dry season and 411 Hinde's Babblers during the wet season (Table 2).

There was no season significant difference in the population densities of Hinde's Babbler in the three of protection (Kruskal Wallis, dry, P = 0.171 and wet, P = 0.635).

Table 2: Population of Hinde's Babblers across the Gradient of Protection

Landscape		Dry season				Wet season			
Land-scape	A	Groups/area	Groups	n/a	P	Groups/area	Groups	n/a	P
Ngaya FR	6.93	7.81	55	36.72	255	4.69	33	24.22	168
Meru NP	10	2.98	30	13.69	137	4.76	48	18.45	185
Agric Sites	4	10.71	43	36.9	148	3.57	15	14.29	58
Total	20.93	21.5	128	36.9	540	13.02	96	56.96	411

3. Discussion

Hinde's Babbler is a gregarious species. Higher mean group sizes were recorded during the wet season compared to the dry season in all landscapes. This is an indicator of success in breeding from the previous years or reduction in territorial behaviour leading to formation of bigger groups (Njoroge et al., 1998). The assumption might not hold with the low offsprings ratio in both seasons, thus non-breeders might have joined the breeding pair and delayed their breeding resulting in high mean group sizes during the wet season. These findings compare favorably with the findings of Shaw and Musina (2003), who reported that Hinde's Babblers flock in groups of 2 - 4 individuals though the number of individuals in groups may vary depending on a number of factors (e.g. site and habitat type).

Seasonal variations have a profound effect on the species' demographics, due to their impacts on resource availability. The population of Hinde's Babblers declined during the wet season, this might have been affected by breeding that is known to occur between March to May and September to October, coinciding with the main periods of rainfall, meaning breeding pairs relocated to vacant territory with better resources (Shaw & Musina, 2003). In other studies, conducted elsewhere (e.g. Njoroge & Mutinda, 1996) they found out that individuals tending to nest (incubating) or hatchlings might not respond to playback. These individuals might have been overlooked during the wet season survey and resulting in low count. Mulwa et al. (2013) recorded similar results that bird communities are susceptible to seasonal variation in resource availability and they may tend to change their activities and locality to cope to the situation. This might have been the case with Hinde's Babbler groups during the wet season as some groups might have relocated to sites with protection and food resources.

Hinde's Babbler population is thought to be declining since it is known from a small number of locations within a small range, where its habitat is undergoing severe fragmentation (Collar et al., 2016). Its population was believed to be between 1000-3700 mature individuals of Hinde's Babbler with a decreasing trend because of perceived habitat fragmentation within its range (BirdLife International, 2012). The results of this survey provided substantial numbers (Hinde's Babbler of 540- dry and 411-wet season) to trigger downlisting of the species. This is a clear demonstration of how the condition of habitat plays a crucial role in conservation of threatened species. For instance, when the population had declined to just seven birds, the remaining individuals were relocated to nearby Mangere Island (Venables & Brooke, 2015). Through organized programmes the population began to recover steadily to stability levels (BirdLife International, 2014a). implying that change of habitat, from one that is unmanaged to a protected one is important in population recovery.

Protected areas play a crucial role in biodiversity conservation as they are uniquely placed to protect endangered species (Barnes et al., 2014; Greve et al., 2014). Ngaya Forest Reserve survey results showed that the site has great potential for conservation of the globally threatened Hinde's Babbler. For instance, much higher mean group size of Hinde's Babbler was recorded in Ngaya Forest Reserve than that recorded in Kianyaga (Shaw et al., 2013). They should be incorporated with the surrounding matrix in species conservation through designation. For instance, Mukurweini and Kianyaga Valley are the already known IBA sites in the agricultural landscape, designation of Murera Springs and Kiruyu as IBAs could be an appropriate mechanism of securing this population around Meru National Park. Didham et al. (2007) reported similar results that agricultural landscapes have great ability of supporting species due to their adequate vegetation biomass throughout the year.

Hinde's Babbler groups were restricted to shrub vegetation cover in the three landscapes. This concurs with studies by Collar et al. (2016) which found out that Hinde's Babbler groups were restricted to Lantana camara thickets. There was variation on the percent shrub cover frequently used by groups in the three landscapes. In MNP, groups were restricted to riverine thickets and some Lantana camara thickets along the fenceline while in Ngaya Forest Reserve they were encountered in a stretch of Lantana camara. In contrast, in the agricultural landscape Hinde's Babbler groups were restricted to thickets at the edges of farms and along the river riparian zone with some thicket cover. These areas experienced little disturbance probably due to their inaccessibility and thereby less disturbance from animals and human beings (Kamiti, 2003). Though, most groups were encountered along river valleys in Meru National Park and agricultural landscape, their occurrence in Ngaya Forest Reserve suggest that they are not dependent on water. The distribution of Hinde's Babbler groups in Ngaya Forest Reserve seemed to follow the distribution of Lantana camara. Similar results were recorded by Shaw et al. (2014) when assessing the range and habitat of Hinde's Babbler in relation to temporal variation in scrub cover.

4. Conclusion

The distribution of Hinde's Babbler groups was associated with sites that had shrub cover. More Hinde's Babbler groups were encountered in protected sites (Ngaya Forest Reserve and Meru National Park) compared to agricultural sites (Kiruyu and Murera Springs). In terms of seasonal changes in population of Hinde's Babblers, more individuals were encountered during the dry season compared to that sighted in the wet season. The onset of rains and consequent flooding of river valleys affected the distribution of Hinde's Babbler groups.

5. Recommendation

Designation of IBAs in agricultural sites of Murera Springs and Kiruyu and engagement with local communities around these areas to safeguard the population of Hinde's babbler.

Acknowledgement

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