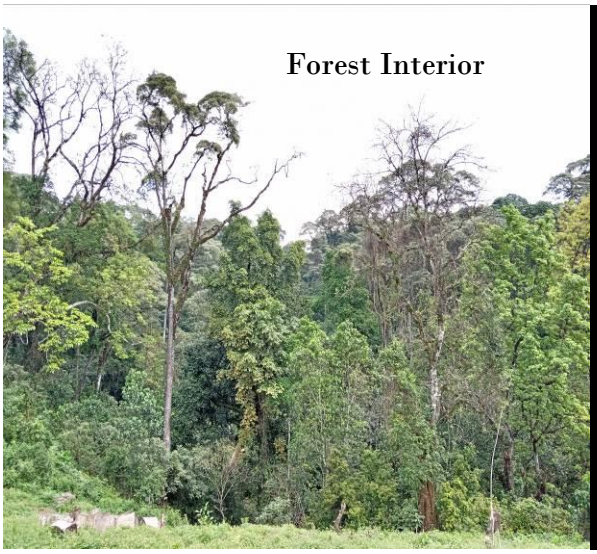
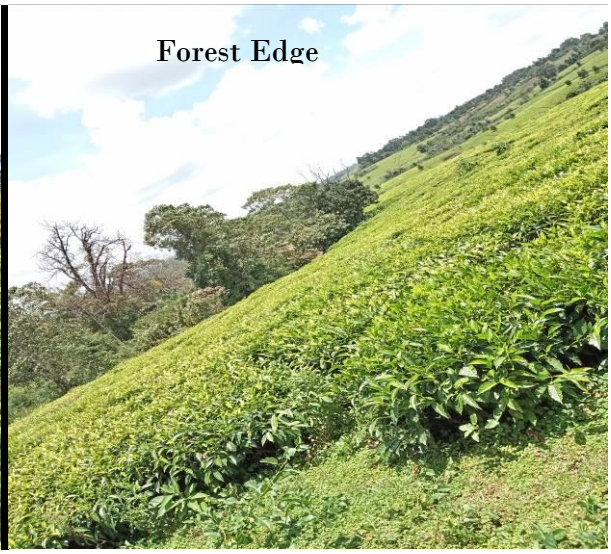
Final Report

Title: Population and Habitat Status of Turner's Eremomela *Eremomela turneri* in South Nandi Forest, Kenya





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Executive Summary

This study focused on the population and habitat condition of E. *turneri* in South Nandi Forest Reserve, one of the surviving relics of the Guineo-congolian tropical rain forest in Kenya, and population stronghold for the Eremomela. Canopy cover, height and tree species are the known principal habitat suitability proxies for the species. Previous research had concluded that the population was declining under fast loss of suitable habitat, E. *turneri* is restricted to pockets of small suitable habitats in the forest. Point counts, following distance sampling protocol were used to sample the birds. The survey was carried out in March 2020. Surveys were conducted in seven survey sites covering the entire forest. Two transects were surveyed at each forest survey site, one at the forest edge and another at the forest interior. A total of 14 transects (7 edge and 7 interior) were covered. Birds were surveyed in 84 count points within the 14 transects. A total of 41 E. *turneri* individuals were recorded within 6 transects. No E. *turneri* was recorded within transects located within forest edge. All the birds were observed perched in the canopies of *Croton megalocarpus* within an average canopy height of 22m. The overall estimated density of E. *turneri* in this forest was 0.12 ±.05/ha with an overall estimated population size of 3819 individuals. In comparison, Kosgey (1998) estimated a density of 1.06/ha with overall population of 13,900 individuals while Nickson et al. (2011) estimated density of 1.11/ha representing an overall estimated population of 14,418 individual birds. Forest structure and disturbance were assessed within 20x20m quadrants at the points along each 1km birds' survey transect. A total of 42 quadrants were surveyed within forest edge and 42 within forest interior. Average canopy cover was 51% at the forest edge and 50% at the interior. Mean canopy height was 18m at forest edge and 22m at the forest interior. There was a positive relationship between canopy cover and sighting of E. *turneri* in the forest interior sites surveyed during this study. More individuals were observed as average canopy cover increased. During the survey, a total of 127 species from 36 families were recorded. Overgrazing, encroachment, logging and charcoal burning were the main forest disturbance elements recorded. The levels of exploitation in South Nandi forest were indifferent for both forest edge and forest interior. 8 forest adjacent community members drawn from South and North Nandi SSGs were trained on citizen-led scientifically defensible protocol for birds and habitat monitoring to continue populating reliable biodiversity conservation data. South Nandi Forest remains a critical habitat and stronghold for *E. turneri*. The bird is rare, and distributed in small numbers within small pockets of suitable habitat in South Nandi forest. The population of Turner's Eremomela in South Nandi is smaller than earlier estimated. Participatory data collection involving local community should be supported to arch monitoring of birds and habitat trends, and habitat restoration and sustainable forest management should be prioritized to secure the South Nandi Forest rich biodiversity.

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1. 0 Background

Turner's Eremomela *Eremomela turneri* is one of the most threatened bird species in Kenya that had remained for years categorized as endangered under the IUCN Redlist (Birdlife 2016) before being down listed to Near Threatened in 2020. E. *turneri* has a small habitat preference restricted to high forest canopy, and it is one of the primary trigger species for South Nandi Important Bird Area (IBA no. 55). *E. turneri* is endemic to the Guinoe-Congolean forest habitat biome stranding southward of Kenya from the once contiguous South Nandi and Kakamega forests, western Uganda, and the Democratic Republic of Congo (Bennun & Njoroge 1999). Being a biome forest specialist, *E. turneri* faces an unaccounted risk of extinction posed by the fast habitat degradation and loss resulting mainly from human induced causes (Kosgey 1998 & Otieno 2011).

E. turneri occurs in scattered and severely fragmented range within the mid-altitude East African forests that host its micro-habitats (Collar & Stuart 1985). Although information about their numbers, distribution and habitat status remain limited, previous studies (Otieno et al. 2011, Kosgey 1998), paint a picture of declining populations against fast loss of suitable habitat. Bird species with small, declining and isolated populations are constantly susceptible to survival perturbations occasioned by breeding bottlenecks and a variety of other random risks. Thus, the conservation needs of specialist species such as the *E. turneri* whose distributions are restricted to pockets of small suitable habitats depends critically on sustained protection of the ecosystem where they are known to occur. Tracking status of the population size becomes central for the preservation and informed management of such species in greater danger.

South Nandi forest is one of Kenya's 67 IBAs, which hosts more than 110 bird species, many of which are range restricted or endemic to the Guineo-Congolean forest habitat biome such as the Chapin's Flycatcher *Mucicapa lendu* (Kokwaro 1998). However, the forest ecosystem faces exponential threats ranging from excisions of the protected area and encroachment for land use conversion. For example, since the Kenya Indigenous Forest Conservation Programme ended in 1993, Waiyaki (1998) observes that reduction in forested area threatens the survival of biodiversity. The main threats include the considerable agricultural encroachment, illegal tree extraction, intensive cattle grazing with some permanently living in the forest, and charcoal burning. Notable is the removal of *Croton megalocarpus*, a dominant tree species known to be used by the *E. turneri* intensively as a foraging ground. There is an urgent need for a monitoring protocol that is adaptable by the local community to profile threats within the ecosystem for immediate and actionable remedies if the rich biodiversity is to survive.

The prevalence of preferred vegetation structure is not only vital for survival of the endangered birds but also the general biodiversity in the delicate ecosystems. Modifications such as removal of high canopy tree species pose imminent danger to forest specialist birds such as the *E. turneri* that have evolved niches for the specific forest conditions. There is need for a scientifically defensible approach of filling the information gap on the preferred structure of the vegetation

micro habitats suitable for this endangered species within the forest. The vertical structural diversity of the vegetation, tree density and the understory characteristics determine the survivability of *E turneri* in an area. Recording these habitat parameters is necessary for designing an applicable and relevant habitat monitoring tool.

Early 2019, IUCN Red List Team sought the down listing of *E. Turneri* from its Endangered threat status albeit lack of reliable scientific information on the current size of its numbers across its range under the unknown habitat status. The recent Intergovernmental-Policy Platform on Biodiversity and Ecosystem Services (IPBES) report (IPBES 2019) asserted that the rapid deterioration of the health of the global ecosystem is principally propagated by human actions. Nature Kenya has been working with the local communities around IBAs in Kenya with a mission of connecting people with nature. Conservation of biodiversity hotspots and the valued wildlife in them will prosper when the local community is endowed with capacity to guard nature around them while being able to apply localized and informed remedies to tame detected threats. There is need for capacity on detailed biodiversity monitoring skill build up in the forest adjacent community to facilitate continual assessments for collection of data useful for appropriate and timely management decisions. Individuals from the adjacent South Nandi Forest trained on detailed monitoring of *E. turneri* and its habitat characteristics shall continue the data collection for consistent species monitoring post the project funding at relatively reliable and least expensive means.

2.0 Study Objectives

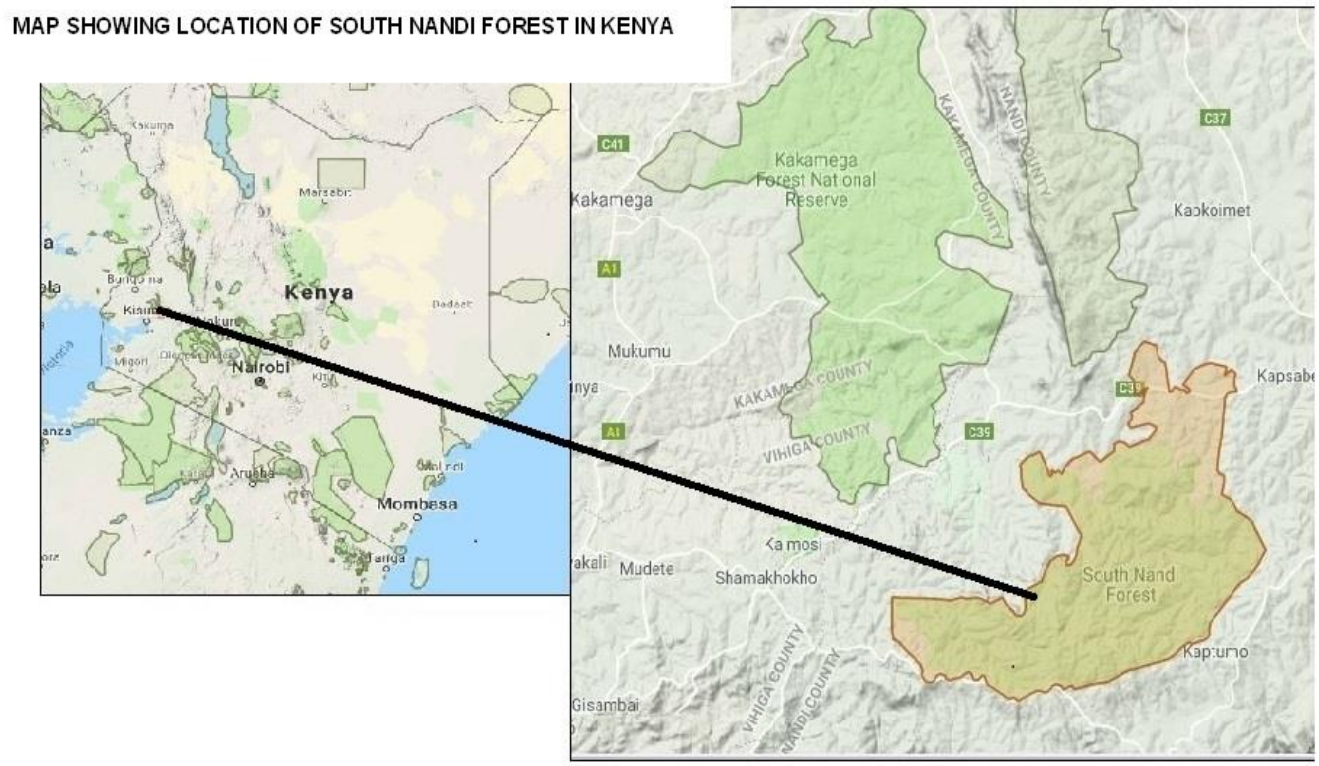
1. To determine the population size and density of E. *turneri* in South Nandi Forest
2. To profile the vegetation structure of E. *turneri* habitat in South Nandi Forest
3. To profile threats facing the forest and survival of E. *turneri* in South Nandi Forest
4. To review the extant literature for comparable data for forming trends
5. To train three local community members on E. *turneri* and habitat disturbance monitoring
6. To develop a simplified biodiversity monitoring protocol for South Nandi Forest

3.0 Methodology

3.1 Study Area

The study was carried out in South Nandi Forest Reserve, which is one of the last relics of the Guineo-congolian tropical rain forest in Kenya. The forest neighbors Kakamega Forest and North Nandi Forest (*see map below*).The forest is located west of Kapsabet town; it lies between altitude range of 1700m and 2000m. It is a main catchment upstream of Lake Victoria, with climate characterized by favorable annual rains (1600mm-1900mm), mean annual temperature

ranging between 17º C and 25ºC. South Nandi Forest is home to rich biodiversity and is surrounded by intensive agricultural community.



3.2 Survey Methods

3.2.1 Bird Surveys

Bird surveys were done in point counts using distance sampling protocol (Bibby et al. 1998; Buckland et al. 2001). 1 km transects were surveyed with counts happening at every 200m interval. Observers walked slowly in a predetermined 1000m route stopping at each point for 10 minutes to look and listen for *E. turneri*, and recording any birds heard or seen on either side of transects. Although *E. Turneri* calls are not very loud, the observers initially practiced to be able to detect the birds reliably within 50m west or east of the direction route. Perpendicular distance of each bird from the transect centerline was estimated. On sighting or hearing E. *turneri*, observers moved off-transect to the nearest point where they could see them clearly for an accurate count of the group size. Double counting was controlled by ensuring that transects are located not less than 200m apart (Nomani et al. 2012). Any birds flying from one tree to another when spotted the first time were counted.

3.2.2 Forest Structure and Disturbance

Threats to habitat of E. *turneri* were assessed through investigating forest structure (canopy height, % cover, forest regeneration) and different parameters of disturbance (overgrazing, tree cutting, paths etc).

The habitat structure and forest regeneration were assessed within the 1000m birds' transect according to Walters, Colin and Jackson (2006). A 20x20m quadrant was created at every point birds counted, and a 2x2m quadrant at the center of the larger quadrant. All trees (16≥50cm dbh and ≥3m height) and poles (5≥15cm dbh and ≥2m height) live or dead, cut stumps, and tree species names were recorded in the 20x20m unit. Canopy height and percentage cover were estimated by an observer standing at 5m from the center of the 20x20m quadrant from west and east of the transect direction. An improvised cone (the hard tubular paper at the center of ordinary tissue paper) was used to estimate the percentage canopy cover on the west and east of the direction of the transect route, and an average calculated. Regeneration was assessed in the 2x2m plot at the center of the 20x20m quadrant by counting all seedlings (5cm-2m height).

Disturbance was assessed by counting the number of animals (cows, goats, and sheep) seen and the distance from nearest human settlement noted down. The number of paths seen were counted, and a score of overall combined pressure was noted, in a score of 0 (lowest combined pressure) to 4 (the highest combined pressure). All cut tree stumps seen, charcoal kilns, and any form of dried wood collection within the quadrant were recorded.

3.2.3 Literature Review

A desktop study was carried out to review extant literature for secondary data on E. *turneri* in South Nandi forest. Turner's Eremomela was used as the key word to search online sources, and relevant grey sources reviewed to supplement data mining.

3.2.4 Biodiversity Monitoring Capacity Building

The local Site Support Groups (SSGs), South Nandi Biodiversity Conservation Group (Sonabic) nominated 4 members (2F, 2M) who were inducted and involved in the survey.

3.2. 5 Survey Strategy

South Nandi Forest was stratified into Forest Edge (highly degraded/disturbed) and Forest Interior (near pristine) based on the level of forest openness, degradation, distance from homesteads and forest intactness). Seven survey sites, covering the whole forest were identified hence; *Chebilat, Kaptilol, Kamarich, Kapsasur, Kamobo, and Chepkongóny*. Transects were laid at the edge and interior of each surveying site. Forest edge was the exterior belt within 500m from forest boundary while the forest interior started at 1km from the forest boundary.

Observers conducted a reconnaissance to familiarize with the forest with guidance from the members of the SSG, and practiced to perfect distance estimation and positive identification of

E. turneri. The surveys started at 0700hrs until 1000hrs when the birds' activities declined. Forest structure and disturbance assessments were conducted after stopping of birds surveys.

3.2.6 Data Analysis

Data was processed and managed in MS Excel. Graphs were developed by MS Excel. Density and population was calculated through DISTANCE software (Buckland et al., 2001).

4. 0 Results and Discussion

Surveys were conducted in seven survey sites covering whole of South Nandi Forest. Two transects were surveyed at each forest survey site, one at the forest edge and another at the forest interior. A total of 14 transects (7 edge and 7 interior) were covered for *E. turneri* survey. Forest structure and disturbance were assessed within 20x20m quadrants along each 1km birds' survey transect. The quadrants were placed at intervals of 200m in each transect. A total of 42 quadrants were surveyed within forest edge and 42 within forest interior. Inference was made to earlier E. *turneri* research in South Nandi for comparison of results of this survey.

4.1 Bird Community

4.1.1 Population and Habitat of Turner's Eremomela

Point counts along transects at the edge and interior of each forest survey site at South Nandi forest were surveyed for E. *turneri*. Birds were surveyed in 84 count points within 14 transects representing the important Eremomela habitat in the forest. Vegetation data was also collected at each birds' count point. A total of 41 E. *turneri* individuals were recorded. No E. *turneri* was recorded within transects located within forest edge. All the birds were observed perched in the canopies of *Croton megalocarpus* within an average canopy height of 22m.

The overall estimated density of E. *turneri* in this forest was 0.12 ±.05/ha with an overall estimated population size of 3819 individuals. In comparison, Kosgey (1998) estimated a density of 1.06/ha with overall population of 13,900 individuals while Nickson et al. (2011) estimated density of 1.11/ha representing an overall estimated population of 14,418 individual birds. During this survey, E. *turneri* were recorded in 6 of the total 14 transects covered, which represents an estimated 42.86% of habitat suitability for the birds in the forest or 5,571.8ha of the 13,000ha total area of South Nandi Forest. The E. *turneri* is rare in its range and highly selective on suitable habitat occurring only in few pockets within the South Nandi forest. Earlier research extrapolated density to the entire forest area, which may have resulted in overestimated population size of E. *turneri* in South Nandi forest.

Earlier studies identified canopy height, canopy cover, and tree species as important predictors of presence of E. *turneri* in South Nandi forest. Kosgey (1999) highlighted canopy heights greater than 20m as most preferred by E. *turneri*. Although there was no significant difference in percentage canopy cover between forest interior and forest edge, the average height was highest,

22m, within forest interior. Otieno (2011) indicated that percentage of canopy cover and forest disturbance levels did not seem to strongly influence presence of E. *turneri* in South Nandi forest. There was a positive relationship between canopy cover and sighting of E. *turneri*. More individuals were observed as average canopy cover increased (figure 1).

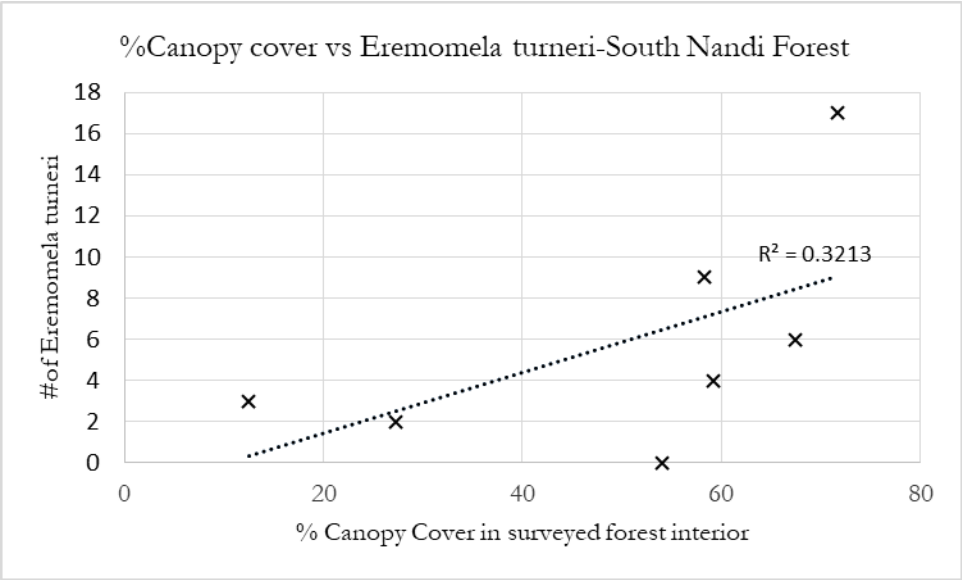


Figure 1: This figure shows there is a positive correlation between presence of E.*turneri* and Forest Canopy Cover.

4.1.2 Bird Community composition

During the survey, a total of 127 bird species from 36 families were recorded (Appendix 1). Unique birds recorded included Grey Crowned Crane, Turner's Eremomela and migratory species. The bird community recorded during the rapid survey comprised of many representative species typical of afro-montane forest biome. The community included: 32 forest dependent (FF), 43 forest generalists (F), 33 forest visitors (f), and the rest (26) being non-forest species. See Table 1 below. South Nandi forest is an important habitat for forest dependent and non-forest birds.

Table 1: Different categories of species recorded in this survey

Category	**Status**	**Number Recorded**
Forest Dependent Species	Forest specialists (FF)	32
	Forest generalists (F)	43
	Forest visitors (f)	33
IUCN Red List Species	Endangered	1
	Near Threatened	1
Migratory Species	Palearctic Migrants (PM)	4

	Afro-tropical migrants	6

4.1.3 Species diversity within South Nandi Forest

Birds occurred at the edge and inside the forest in varying abundances and species richness. Diversity in the different survey sites was high.

Species Richness

The survey of South Nandi forest recorded high species richness and abundance.

Species richness was higher within the forest edge (251) compared with forest interior (211) (Figure 2). More open forest such as at the Chepkumia survey site recorded higher bird abundance compared with more closed forest at Kapsasur survey area. During the entire survey, Turner's Eremomela was recorded at forest interior only.

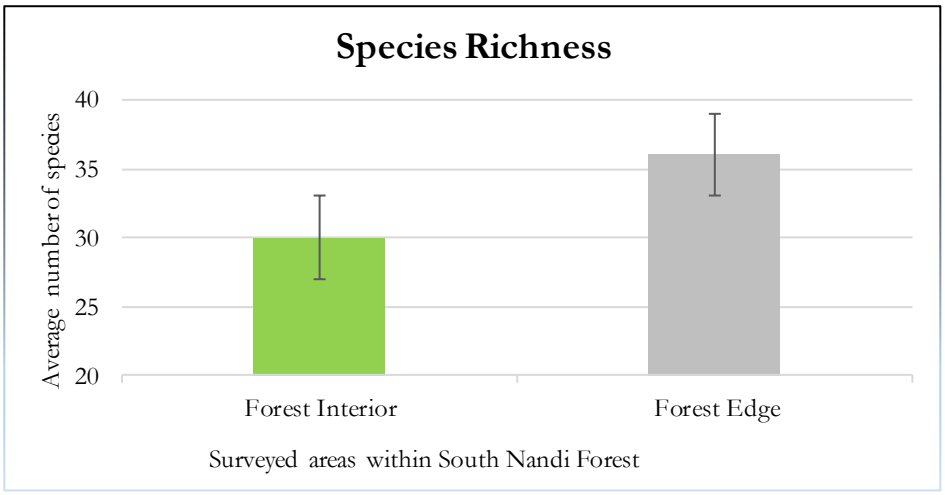


Figure 2: A graph showing bird species richness between forest interior and edge of South Nandi Forest

Species Diversity index (H)

Although the difference in species diversity index across the surveyed forest area was marginal, forest edge recorded higher diversity index compared with forest interior (Figure 3). Forest edges are defined by different habitat conditions from the interior that was characterized by high closed canopy. Non-forest birds, forest visitors and generalists were common along the edges compared with the few forest specialists whose habitat was suitable only at the forest interior. Some non-community specialists, for example insectivores, understory gleaners, cavity nesters and long distance migrants depicted preference for forest edges as reflected by their high abundances compared with forest interior populations.

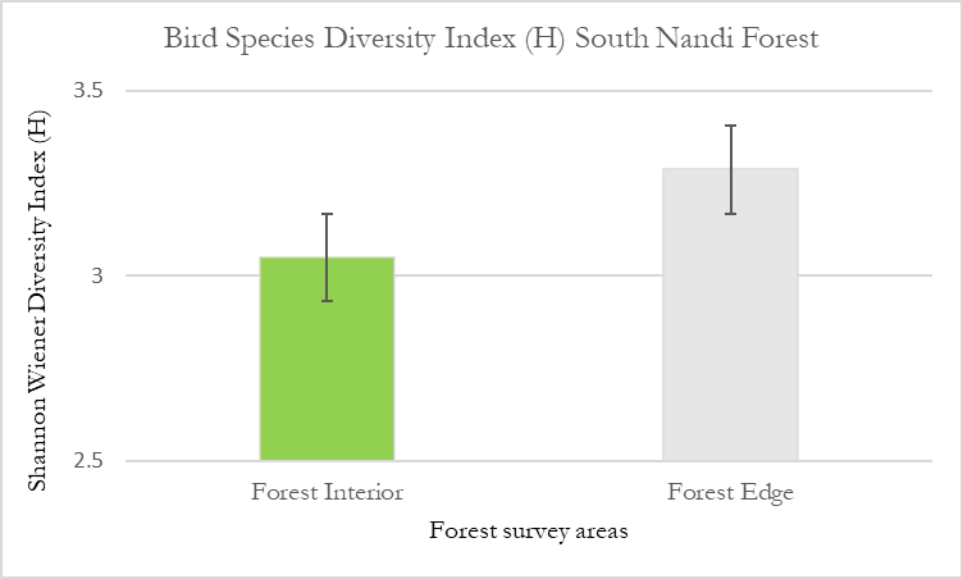


Figure 3: Graph showing difference in diversity of birds of South Nandi Forest

4.1.4 Summary for trends in Key Parameters

Table 2 below is a summary providing mean species richness and abundance, forest dependent and number of E. *turneri* recorded concurrently within South Nandi forest. The number of E. *turneri* seen in each forest area is reported for establishment of trends in future surveys. As monitoring of the forest for Turner's Eremomela and important forest disturbance parameters continues, variances in their population, bird diversity and abundance in response to management practices or climate change will become apparent.

Table 2: Summary of mean species richness, forest specialists, and number of Turner's Eremomela recorded

Forest Survey Site	**Species Richness** (forest interior & edge)		**Forest Specialist Species (FF)**	**Turners Eremomela**
	Interior	Edge		
1.Chebilat	35	24	12	2
2.Kaptilol	19	37	5	0
3.Kamarich	44	31	8	4
4.Chepkumia	28	49	3	3
5.Kapsasur	31	34	4	17
6.Kamobo	24	42	2	6
7.Chepkongóny	30	34	3	9

4.2 Forest Structure

Forest structure is an important element of habitat suitability for E. *turneri*. Important and easy to measure forest structure variables assessed in this survey included: number of live trees, canopy cover and height, and number of regeneration seedlings as reliable proxies of the state of the forest. These variables were selected as they can easily be integrated in the forest disturbance assessment protocol for South Nandi Forest IBA by the local SSG, whose members were involved and trained.

Assessment involved counting number of live trees and poles, canopy cover and canopy height, and number of seedlings as reliable indicators of forest health or degradation. Tree stems were categorized into Trees (16 ≥ 50cm dbh) and poles (5≥15cm dbh), and were counted at forest edge and interior. More live trees (mean=46) were counted in the forest interior compared with the forest edge (mean=35). The mean for tree stems categorized as poles was higher (186) in the forest interior than in the forest edge (93). Overall, South Nandi forest is dominated by poles compared with the number of trees, which indicates a state of recovery from previous logging/deforestation that reduced larger mature trees.

Canopy cover and canopy height are important proxies of habitat suitability for E. *turneri* (Kosgey, 1999). In the forest areas sampled, average canopy cover was 51% at the forest edge and 50% at the interior. Previous profiling of the forest canopy cover in South Nandi Forest by Nickson et al. (2011) scored 0-30% as open, 34-67% as medium, and >67% as closed forest**.** The mean canopy height was 18m at forest edge and 22m at the forest interior. ***E. turneri*** was never sighted within the forest edge. Table 3 below summarizes average percentage canopy cover, canopy height and the number of Turner's Eremomela recorded. The highest counts of E. *turneri* were recorded in Kapsasur where canopy cover was highest for the whole forest.

Table 3: Comparative summary of forest % canopy cover, height and E. *Turneri* recorded

Forest Survey Site		**% Forest Cover**		**Canopy Height (m)**		**Number of E. *Turneri***
		Edge	Interior	Edge	Interior	
1	Chebilat	74	27	26	23	2
2	Kaptilol	48	54	20	21	0
3	Kamarich	60	60	11	26	4
4	Chepkumia	55	13	25	10	3
5	Kapsasur	58	72	18	23	17
6	Kamobo	19	68	14	28	6
7	Chepkogony	48	58	18	24	9

4.3 Forest Disturbance

Assessment of forest disturbance was carried out at the forest edge and interior within the seven survey sites. The main forest disturbance variables assessed included: grazing pressure (number of cows seen grazing in the forest), charcoal kilns, logging, number of paths, score for combined pressure, and the distance from nearest settlements.

The three main types of forest threats observed across all the survey sites were: overgrazing, logging and charcoal burning. A score of combined exploitation, mean=2, in a score of 0 (lowest) to 4 (highest) was recorded for both forest edge forest interior in all the surveyed forest sites. The levels of exploitation in South Nandi forest are indifferent for both forest edge and forest interior. This was because overgrazing, which was the dominant type of forest disturbance started at the forest edge closer to settlements and animals tended to be driven further into the interior of the forest as grass and browse declined. This observation was attributed to the tendency by animal owners to walk dairy and lactating cows just nearby while large herds of bulls stayed permanently deeper into the forest.

Trampling of young plants by cattle inside the forest was a notable forest degrading feature. The number of seedlings counted during the survey increased in areas where few or no cattle were counted and decreased as the count of animals seen within the sampling block increased. The highest number of seedlings was counted at *forest interior of Chebilat and Kapsasur* where fewest animals were seen. Seedlings count declined sharply at *Chepkumia and Kamobo* where highest number of cattle was recorded at 52 and 65 heads respectively. This form of forest disturbance poses threat to the ability of natural regeneration.

Nickson et al (2011) cited these three forest disturbance types as key forest degrading activities in South Nandi forest. Although active logging was not significantly recorded during this study (average cut trees and poles), overgrazing appears to have greater negative impact on the forest habitat quantity and quality compared to 2011. As noted by earlier researchers, this study recorded high average number of paths in the forest with highest number at the forest interior compared with edge.

5.0 Conclusions and Recommendations

5. 1 Conclusions

South Nandi Forest remains a critical habitat and stronghold for *E. turneri*. The bird is rare, and distributed in small numbers within small pockets of suitable habitat in South Nandi forest. The population of Turner's Eremomela in South Nandi is smaller than earlier estimated. Canopy cover and tree species, canopy height, and the levels of forest disturbance are important predictors of presence or absence. South Nandi Forest is experiencing very high pressure mainly from overgrazing that also endangers the potential of forest regeneration. The local SSG has potential for gathering cheap but reliable citizen-led scientific information to inform adaptive forest management.

5.2 Recommendations

1. This study was done during rainy season, a repeat during drier spell is required
2. Urgent restriction/controlled grazing in South Nandi Forest is required
3. More resources are required to incentivize the local community to embrace forest restoration and sustainable management
4. Regular annual detailed monitoring of the habitat and population of *E. turneri* is required for rainy and dry seasons

5.3 Key Outputs of the Study

1. Updated and reliable data on *E. turneri* to inform biodiversity management decision in South Nandi Forest.
2. Increased capacity of the local community members for E. *turneri* and forest disturbance monitoring to update data on population size and mitigate pressures on the forest.
3. A current scientific publication that will update the existing literature about the population size of the species and the condition of its habitat.

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Appendices

Appendix 1: Checklist of Birds of South Nandi Forest recorded during the survey

Key: CR – Critical, EN - Endangered, NT – Near Threatened; LC Least concern, AM – Afrotropical Migrant; PM – Palearctic Migrant; OM – Oriental Migrant; am/pm/om (lower case) only part of population is resident

#	**Family and Common Name**	**Scientific Name**	**Status**
	Accipitridae: diurnal birds of prey other than falcons		
1	European Honey Buzzard	*Pernis apivorus*	PM, F
2	African Goshawk	*Accipiter tachiro*	F
3	Great Sparrowhawk	*Accipiter melanoleucus*	F
4	Common Buzzard	*Buteo buteo*	PM
5	Long-crested Eagle	*Lophaetus occipitalis*	F
6	Augur Buzzard	*Buteo augur*	
7	Tawny Eagle	*Aquila rapax*	
	Gruidae: cranes		
8	Grey Crowned Crane	*Balearica regulorum*	EN
	Threskiornithidae: ibises and spoonbills		
9	Hadada Ibis	*Bostrychia hagedash*	
	Scopidae: Hamerkop		
10	Hamerkop	*Scopus umbretta*	
	Columbidae: pigeons and doves		
11	Dusky Turtle Dove	*Streptopelia lugens*	f
12	Red-eyed Dove	*Streptopelia semitorquata*	f
13	Ring-necked Dove	*Streptopelia capicola*	f
14	Tambourine Dove	*Turtur tympanistria*	F
15	African Green Pigeon	*Treron calvus*	F
	Musophagidae: turacos		
16	Hartlaub's Turaco	*Tauraco hartlaubi*	FF
17	Ross's Turaco	*Musophaga rossae*	F
	Cuculidae: cuckoos and coucals		
18	Levaillant's Cuckoo	*Clamator levaillantii*	AM, f
19	Red-chested Cuckoo	*Cuculus solitarius*	am, F
20	Black Cuckoo	*Cuculus clamosus*	AM, f
21	Klaas's Cuckoo	*Chrysococcyx klaas*	f
22	African Emerald Cuckoo	*Chrysococcyx cupreus*	F
23	Diederik Cuckoo	*Chrysococcyx caprius*	am
24	Yellowbill	*Ceuthmochares aereus*	am, F

25	Blue-headed Coucal	*Centropus monachus*	
	Coliidae: mousebirds		
26	Narina Trogon	*Apaloderma narina*	F
27	Bar-tailed Trogon	*Apaloderma vittatum*	FF
28	Speckled Mousebird	*Colius striatus*	
29	**Alcedinidae: kingfishers**		
30	African Pygmy Kingfisher	*Ceyx pictus*	am, f
	Meropidae: bee-eaters		
31	Cinnamon-chested Bee-eater	*Merops oreobates*	F
32	White-throated Bee-eater	*Merops albicollis*	AM, f
	Phoeniculidae: wood-hoopoes		
33	White-headed Wood-hoopoe	*Pheoniculus bollei*	FF
	Bucerotidae: hornbills		
34	Crowned Hornbill	*Tockus alboterminatus*	f
35	Black-and-white Casqued Hornbill	*Bycanistes subcylindricus*	F
	Capitonidae: barbets and tinkerbirds		
36	Grey-throated Barbet	*Gymnobucco bonapartei*	F
37	Yellow-rumped Tinkerbird	*Pogoniulus bilineatus*	F
38	Double-toothed Barbet	*Lybius bidentatus*	f
39	Yellow-billed Barbet	*Trachylaemus purpuratus*	F
	Picidae: wrynecks and woodpeckers		
40	Fine-banded Woodpecker	*Campethera tullbergi*	FF
41	Cardinal Woodpecker	*Dendropicos fuscescens*	f
	Platysteiridae: batises, wattle-eyes and relatives		
42	Yellow-bellied Wattle-eye	*Dyaphorophyia concreta*	FF
43	Black-throated Wattle-eye	*Platysteira peltata*	F
44	Chin-spot Batis	*Batis molitor*	
	Malaconotidae: helmetshrikes, bushshrikes, tchagras and puffbacks		
45	Bocage's Bushshrike	*Chlorophoneus bocagei*	F
46	Pink-footed Puffback	*Dryoscopus angolensis*	FF
47	Lühder's Bushshrike	*Laniarius luehderi*	F
48	Tropical Boubou	*Laniarius aethopicus*	f
49	Brown-crowned Tchagra	*Tchagra australis*	
	Campephagidae: cuckooshrikes		
50	Grey Cuckooshrike	*Coracina caesia*	FF
51	Red-shouldered Cuckooshrike	*Campephaga phoenicea*	f
	Laniidae: shrikes		
52	Mackinnon's Shrike	*Lanius mackinnoni*	f

	Oriolidae: orioles		
53	Montane Oriole	*Oriolus percivali*	FF
54	Black-headed Oriole	*Oriolus larvatus*	f
	Dicruridae: drongos		
55	Common Drongo	*Dicrurus adsimilis*	F
	Monarchidae: monarch flycatchers		
56	African Paradise Flycatcher	*Terpsiphone viridis*	am, f
57	African Blue Flycatcher	*Elminia longicauda*	F
58	White-tailed Crested Flycatcher	*Eliminia albonotata*	FF
	Paridae: tits		
59	Northern Black Tit	*Parus leucomelas*	f
60	White-bellied Tit	*Parus albiventris*	f
	Hirundinidae: saw-wings, swallows and martins		
61	Black Saw-wing	*Psalidoprocne pristoptera*	f
62	Barn Swallow	*Hirundo rustica*	PM
	Cisticolidae: cisticolas and allies		
63	Chubb's Cisticola	*Cisticola chubbi*	F
64	Tawny-flanked Prinia	*Prinia subflava*	f
65	Banded Prinia	*Prinia bairdii*	F
66	White-chinned Prinia	*Schistolais leucopogon*	F
67	Black-collared Apalis	*Apalis pulchra*	F
68	Black-throated Apalis	*Apalis jacksoni*	FF
69	Buff-throated Apalis	*Apalis rufogularis*	FF
70	Grey-backed Camaroptera	*Camaroptera brachyura*	f
71	Olive-green Camaroptera	*Camaroptera chloronota*	FF
	Pycnonotidae: bulbuls		
72	Common Bulbul	*Pycnonotus barbatus*	f
73	Shelley's Greenbul	*Andropadus masukuensis*	FF
74	Little Greenbul	*Andropadus virens*	F
75	Yellow-whiskered Greenbul	*Andropadus latirostris*	F
76	Slender-billed Greenbul	*Andropadus gracilirostris*	FF
77	Joyful Greenbul	*Chlorocichla laetissima*	F
78	Cabanis's Greenbul	*Phyllastrephus cabanisi*	FF
79	Red-tailed Bristlebill	*Bleda syndactyla*	FF
	Sylviidae: Old World warblers		
80	Cinnamon Bracken Warbler	*Bradypterus cinnamomeus*	F
81	Black-faced Rufous Warbler	*Bathmocercus rufus*	FF
82	Southern Hyliota	*Hyliota australis*	F

83	Uganda Woodland Warbler	*Phylloscopus budongoensis*	FF
84	Brown Woodland Warbler	*Phylloscopus umbrovirens*	F
85	Willow Warbler	*Phylloscopus trochilus*	PM, f
86	Turner's Eremomela	*Eremomela turneri*	NT, FF
87	White-browed Crombec	*Sylvietta leucophrys*	FF
88	Blackcap	*Sylvia atricapilla*	PM, F
	Timaliidae: illadopses, babblers and chatterers		
89	Scaly-breasted Illadopsis	*Illadopsis albipectus*	FF
90	Pale-breasted Illadopsis	*Illadopsis rufipennis*	FF
91	African Hill Babbler	*Pseudoalcippe abyssinica*	FF
	Zosteropidae: white-eyes		
92	Abyssinian White-eye	*Zosterops abyssinicus*	f
93	African Yellow White-eye	*Zosterops senegalensis*	f
94	Montane White-eye	*Zosterops poliogastrus*	F
	Sturnidae: starlings and oxpeckers		
95	Violet-backed Starling	*Cynniricinclus leucogaster*	AM, f
96	Stuhlmann's Starling	*Poeoptera stuhlmanni*	FF
97	Sharpe's Starling	*Pholia sharpii*	FF
	Turdidae: thrushes		
98	White-tailed Ant Thrush	*Neocossyphus poensis*	FF
99	Olive Thrush	*Turdus olivaceus*	F
100	Brown-chested Alethe	*Alethe poliocephala*	FF
	Muscicapidae: chats, wheatears and Old World flycatchers		
101	Equatorial Akalat	*Sheppardia aequatorialis*	FF
102	Grey-winged Robin	*Sheppardia polioptera*	FF
103	Cape Robin Chat	*Cossypha caffra*	f
104	Blue-shouldered Robin Chat	*Cossypha cyanocampter*	F
105	White-browed Robin Chat	*Cossypha heuglini*	f
106	Snowy-headed Robin Chat	*Cossypha niveicapilla*	F
107	White-eyed Slaty Flycatcher	*Melaenornis fischeri*	F
108	African Dusky Flycatcher	*Muscicapa adusta*	f
109	Common Stonechat	*Saxicola torquatus*	
	Nectariniidae: sunbirds		
110	Collared Sunbird	*Hedydipna collaris*	F
111	Green-headed Sunbird	*Cyanomitra verticalis*	F
112	Olive Sunbird	*Cyanomitra olivacea*	
113	Bronze Sunbird	*Nectarinia kilimensis*	f
114	Olive-bellied Sunbird	*Cinnyris chloropygius*	F

115	Northern Double-collared Sunbird	*Cinnyris reichenowi*	F
	Ploceidae: weavers, bishops and widowbirds		
116	Grosbeak Weaver	*Amblyospiza albifrons*	f
117	Baglafecht Weaver	*Ploceus baglafecht*	f
118	Black-billed Weaver	*Ploceus melanogaster*	FF
119	Dark-backed Weaver	*Ploceus bicolor*	F
120	Brown-capped Weaver	*Ploceus insignis*	FF
121	Red-headed Malimbe	*Malimbus rubricollis*	FF
122	Grey-headed Negrofinch	*Nigrita canicapillus*	F
	Motacillidae: wagtails, longclaws and pipits		
123	Yellow Wagtail	*Motacilla flava*	PM
124	Cape Wagtail	*Motacilla capensis*	
125	African Pied Wagtail	*Motacilla aguimp*	
	Estrildidae: waxbills		
126	Bronze Mannikin	*Spermestes cucculatus*	
	Fringillidae: canaries, citrils, seedeaters and relatives		
127	African Citril	*Crithagra citrinelloides*	f

Appendix 2: List of GPS points for transects covered in South Nandi Forest during the survey

Count Point	Longitude	Latitude
1	34.941412°	0.069036°
2	34.942220°	0.067427°
3	34.942319°	0.065636°
4	34.943720°	0.064488°
5	34.945247°	0.063566°
6	34.946944°	0.062996°
7	34.941435°	0.075592°
8	34.944413°	0.082057°
9	34.946615°	0.084035°
10	34.998465°	0.062133°
11	35.000810°	0.062402°
12	35.003212°	0.062560°
13	35.005250°	0.063180°
14	35.007207°	0.064145°
15	35.007816°	0.072250°
16	35.008060°	0.072244°
17	35.008344°	0.072244°
18	35.008411°	0.072245°
19	35.008642°	0.072261°
20	35.057073°	0.107077°
21	35.054197°	0.108485°
22	35.052955°	0.111930°
23	35.049800°	0.114662°
24	35.045438°	0.115313°
25	35.043015°	0.113616°
26	35.001157°	0.072991°
27	35.001172°	0.073005°
28	35.001189°	0.073016°
29	35.001205°	0.073038°
30	35.001219°	0.073042°
31	35.001465°	0.072177°
32	35.001463°	0.072197°
33	35.001469°	0.072216°
34	35.001479°	0.072247°
35	35.001493°	0.072247°
36	35.001505°	0.072264°
37	34.987800°	0.113861°
38	34.989892°	0.122780°
39	34.990868°	0.129798°
40	34.990248°	0.131353°
41	34.988990°	0.135777°
42	34.986100°	0.141045°
43	35.037801°	0.154796°
44	35.034455°	0.154915°
45	35.034554°	0.155311°
46	35.035414°	0.157208°
47	35.034967°	0.158963°
48	35.037299°	0.161477°
49	35.034295°	0.153203°
50	35.032367°	0.152412°
51	35.031537°	0.150808°
52	35.032257°	0.149037°
53	35.033730°	0.147707°
54	35.033897°	0.145588°
55	35.032390°	0.141313°
56	35.051573°	0.144070°
57	35.050393°	0.142507°
58	35.048679°	0.143828°
59	35.046755°	0.145660°
60	35.045730°	0.147538°
61	35.046965°	0.135022°
62	35.046864°	0.133263°
63	35.044737°	0.132966°
64	35.043396°	0.132446°
65	35.043396°	0.132446°
66	35.042338°	0.130645°
67	35.040378°	0.129783°
68	35.018857°	0.076445°
69	35.018646°	0.078343°
70	35.019368°	0.079745°
71	35.020627°	0.081774°
72	35.021297°	0.083483°
73	35.021318°	0.085447°
74	35.021578°	0.069565°
75	35.022943°	0.069933°
76	35.024382°	0.070031°
77	35.027121°	0.070966°
78	35.029533°	0.071770°
79	35.031231°	0.072209°