

Preliminary observations on the avifauna of Ikokoto Forest, Udzungwa Mountains, Tanzania

Chacha Werema, Jay P. McEntee, Elia Mulungu and Maneno Mbilinyi

Summary

A study was conducted at c. 110 ha of Ikokoto forest using mist-netting and general field observations. Sixty-four species were recorded of which 61% were of conservation importance in terms of forest dependence. All species were found to belong to the familiar assembly of the large Udzungwa forests. Six species, the Green-throated Greenbul *Andropadus fusciceps*, Spot-throat *Modulatrix stictigula*, African Tailorbird *Artisornis metopias*, Black-lored Cisticola *Cisticola nigriloris*, Uhehe Fiscal *Laniarius marwitszi* and Fülleborn's Black Boubou *Laniarius fuelleborni* detected are restricted range and one species Moreau's Sunbird *Nectarinia moreaui* is near-threatened according to IUCN threat status. The presence of many species which are forest dependent in this tiny forest indicates that this site, though small in size and highly fragmented, retains significant conservation value for birds.

Introduction

Ikokoto Forest lies in the northeast part of the Udzungwa Mountains, southern Tanzania. The latter form the southernmost and largest block of the Eastern Arc Mountains, which are known globally for extraordinarily high levels of endemism, largely attributed to their ancient geological age and long-term climatic stability (Lovett & Wasser 1993). Like many other Eastern Arc Mountain forests, Ikokoto forest is fragmented; it covers the peaks of two hills, which are surrounded by farmland matrix and isolated from other forest patches. Both fragments are under pressure from hunting, agriculturalist conversion, timber felling, and extraction of other wood products such as building poles and fuel wood.

In July 2009 we visited this forest to make sound recordings of, and perform playback experiments to, Fülleborn's Sunbird *Nectarinia fuelleborni*. During our time there we also mistnetted and made opportunistic observations of the avifauna. In this paper we report the results of this informal survey carried out over the course of 10 days. Despite extensive accounts of the avifauna in the Udzungwa Mountains in what are at present protected areas (Dinesen *et al.* 1993, Fjeldså 1999, Jensen & Brogger-Jensen 1992, Stuart *et al.* 1981, Stuart *et al.* 1987), we did not have any previous information on the structure of the avian community at the Ikokoto forest. To the best of our knowledge this paper is the first published attempt at documenting the avian community in this forest.

Materials and methods

Study area

The two patches that make up Ikokoto forest are located at 7°41'S, 36°06'E about 10 km north-east of Ilula town, just south of the Iringa – Dar es Salaam Road in Kilolo District, Iringa Region (see Fig. 1). This area was previously recommended for inclusion in a potential forest reserve (referred to as Kitonga Forest Reserve, Moyer 1992), but that reserve was never established (D. Moyer, pers. comm.). The fragments are located at elevation ranging from 1664–1954 m and comprise approximately 110 ha of montane forest (Moyer 1992), which is severely fragmented as a result of agricultural activities in the surrounding matrix. A recently built road passes from the upper part of Ikokoto village east through the major forest fragment, and eventually to the mobile phone towers that are visible from the Kitonga Gorge pass. The other forest patch, west of the upper part of Ikokoto village, is reached by foot from agricultural land just south of the village.

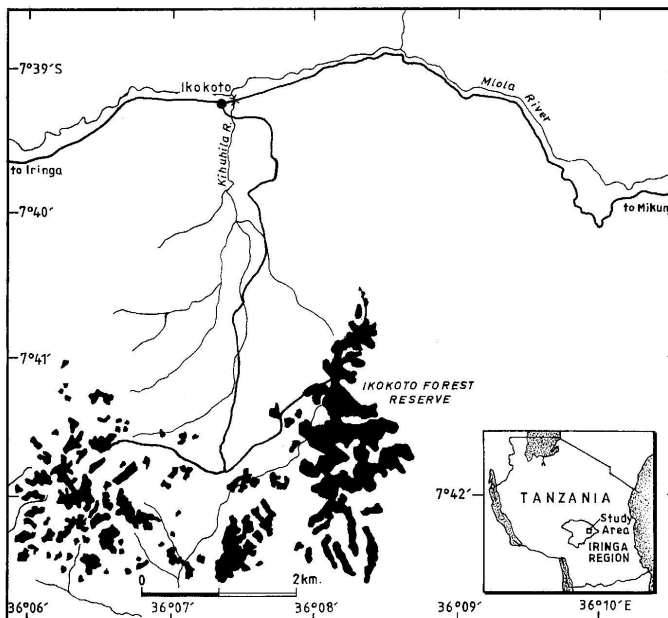


Figure 1. Location of Ikokoto village-managed forest.

Methods

Birds were surveyed opportunistically using a combination of mistnets and general observations from 12–21 July 2009. All the authors were familiar with montane forest-dependent birds through fieldwork at various locations within the Eastern Arc Mountains. All birds seen or heard well were noted individually by each of the authors over 10 days of fieldwork. The primary focus of the fieldwork involved making sound recordings of particular focal species, capturing focal species using mist nets, and playback experiments to Fülleborn's Sunbird. General avifaunal surveys were a secondary objective, and therefore should not be treated as exhaustive or systematic surveys. We set four mist nets each 12 m long, 3 m high, and with a mesh size of 16 mm for a total of approximately 18 h making a total of 864 metres-net-hours. At all

times during mistnetting, at least two nets were positioned at the forest edge near flowering shrubs (including *Leonotis* sp.) to target sunbird captures. The remaining one to two nets were placed in the forest understorey.

We classified species according to their dependence on forest habitat using Bennun *et al.* (1996) and Romdal *et al.* (2003) where forest specialists are species that depend on the forest for their survival. Generalists are those species which frequent forest but also exist in alternate habitats. Taxonomy and nomenclature follow Britton (1980) with exception of the following species: African Wood Owl *Strix woodfordii* (where we used Fry *et al.* 1988), Richard's Pipit *Anthus novaeseelandiae* (we used Keith *et al.*, 1992), White-tailed Crested Flycatcher *Elminia albonotata*, White-eyed Slaty Flycatcher *Melanornis fischeri*, African Grey Flycatcher *Melanornis microrhynchus*, African Tailorbird *Artisornis metopias*, Black-lored Cisticola *Cisticola nigriloris* and Evergreen Forest Warbler *Bradypterus lopezi* (where we used Urban *et al.*, 1997), and Tropical Boubou *Laniarius aethiopicus* where Fry and Stuart (2000) were used.

Results

We recorded 64 species representing 28 families. A full list of birds recorded both in mist nets and using observations is shown in Appendix 1. Of the 64 species, 39 (61%) are of conservation importance in terms of forest dependence (both FF and F categories, Appendix 1). Of these 37 species, 59% (22 species) are strict forest dependent species (category FF) that cannot survive deforestation.

Despite the fact that mist netting effort was low, 40 individual birds in 13 species were captured. The most abundant in terms of catch rate was Fülleborn's Sunbird (Table 1). The other abundant species were Green-throated Greenbul *Andropadus fusciceps* and Forest Batis *Batis mixta*. Other species mist netted had low catch rates represented by one or two individuals.

Table 1. Species mist netted at Ikokoto forest.

Species	No. of individuals	Catch rate (per 1000 metres-net-hours)
Cabanis (Placid) Greenbul <i>Phyllastrephus cabanisi</i>	1	1.2
Green-throated Greenbul <i>Andropadus fusciceps</i>	5	5.8
Shelley's Greenbul <i>Andropadus masukuensis</i>	1	1.2
White Starred Forest Robin <i>Pogonocichla stellata</i>	2	2.3
Forest Batis <i>Batis mixta</i>	4	4.6
African Hill Babbler <i>Pseudoalcipe abyssinica</i>	1	1.2
African Tailorbird <i>Artisornis metopias</i>	2	2.3
Bar-throated Apalis <i>Apalis thoracica</i>	2	2.3
Uhehe Fiscal <i>Lanius marwitzi</i>	1	1.2
Fülleborn's Sunbird <i>Nectarinia fuelleborni</i>	18	20.8
Variable Sunbird <i>Cinnyris venustus</i>	1	1.2
Fülleborn's Black Boubou <i>Laniarius fuelleborni</i>	1	1.2
Red-faced Crimsonwing <i>Cryptospiza reichenovii</i>	1	1.2

Discussion

Our results show that Ikokoto forest supports a fairly rich avifauna despite its small size. The bird species composition observed at this forest reveals that all species

belong to the familiar assembly of the larger Udzungwa Mountain forests, including the characteristic restricted-range species Green-throated Greenbul, Spot-throat *Modulatrix stictigula*, African Tailorbird, Black-lored Cisticola, Uhehe Fiscal *Lanius marwiti* and Fülleborn's Black Boubou *Laniarius fuelleborni* (Fjeldså *et al.* 2010) and Moreau's Sunbird *Nectarinia moreaui* which is Near-Threatened according to IUCN (www.iucnredlist.org). However, some species which occur in other surveyed north-eastern Udzungwa forests (e.g. Nyumbanitu, Mwahihana, Luhombero, Ndundulu, etc., see Fig. 1) were not observed, including Rufous-winged Sunbird *Nectarinia rufipennis*, Swynnerton's Robin *Swynnertonia swynnertonii*, White-winged Apalis *Apallis chariessa* and Dappled Mountain Robin *Arcanator orostruthus* (Stuart *et al.* 1981, Stuart *et al.* 1987, Jensen & Brøgger-Jensen 1992, Dinesen *et al.* 1993, Dinesen 1998, Dinesen *et al.* 2001, Butynski & Ehardt 2003, Fjeldså *et al.* 2010). This could be due to the size of Ikokoto forest being small, as smaller fragments are known to contain fewer species than larger-sized fragments (Newmark 1991). The other reason could be due to low sampling effort as the number of days spent in the field were few.

Because of the low mist netting effort the numbers of species and individuals mist netted were low. The high catch rate of *N. fuelleborni* is due to the fact that we essentially set mist nets wherever we located the calling male sunbirds as the main objective of the study was to record and catch them.

Based on this preliminary survey at Ikokoto forest, we suggest that the forests of the Udzungwa are likely to exhibit the nested subset pattern widely reported across a diversity of similar patchy or island-like habitat distributions (Cordeiro, 1998). Species composition shows that Ikokoto forest belongs to the assembly of the entire Udzungwa Mountains range (Stuart *et al.*, 1987, Jensen & Brøgger-Jensen 1992, Fjeldså *et al.* 2010). In fact, the Udzungwa forests represent a desirable intermediate geographic scale for nestedness analysis between the two scales thus far examined for Eastern Arc birds: smaller-scale anthropogenic fragmentation in the East Usambara Mountains (Newmark 1991) and the larger-scale habitat islands represented by the Eastern Arc's major mountain blocks (Usambara, Udzungwa, Uluguru, etc.; Cordeiro 1998). Across these three scales, a comparative investigation of community nestedness (e.g. the degree to which one community is a subset of another) and individual species occupancy may provide valuable insight that could link population-level processes (e.g. stochastic local extirpation, persistence, gene flow) with emergent evolutionary biogeographic patterns (e.g. divergence, extinction). This calls for further surveys both during cold and hot seasons at Ikokoto forest.

Conservation implications

The results from this study indicate that despite the fact that Ikokoto forest is small, it is still important for conservation of birds and possibly other fauna groups. The presence of many forest-dependent bird species at Ikokoto, including range-restricted forest understorey taxa (e.g. Spot-throat), is a sign that this area retains significant conservation value despite its extensive fragmentation. This implies that the remaining forest is worthy of careful conservation and management measures to guarantee its long term survival.

Acknowledgments

We would like to thank the village government of Ikokoto Village. David Moyer, Neil E. and Liz Baker are assisted us in suggesting Ikokoto forest as a research destination. A National

Geographic Society/Waitt Foundation grant to JPM funded the bulk of this research. JPM was further supported by a U.S. National Science Foundation Graduate Research Fellowship, an Exploration Fund grant from The Explorers' Club, an American Ornithologists' Union Research Award, a Beim Summer Research Fellowship (Integrative Biology Dept., UC Berkeley), and a Louise Kellogg Grant from the Museum of Vertebrate Zoology. We further thank the Commission for Science and Technology (permit No. 2009-183-ER-2007-117) and the Tanzania Wildlife Research Institute for national level permissions.

References

- Bennun, L., Dranzoa, C. & Pomeroy, D. 1996. The forest birds of Kenya and Uganda. *Journal of the East Africa Natural History Society* 85: 23–48.
- Britton, B.L. 1980. *Birds of East Africa*. Nairobi: EANHNS.
- Butynski, T.M. & Ehard, C.L. 2003. Notes on ten restricted-range birds in the Udzungwa Mountains, Tanzania. *Scopus* 23: 13–28.
- Cordeiro, N.J. 1998. Preliminary analysis of the nestedness patterns of montane forest birds of the Eastern Arc Mountains. *Journal of East Africa Natural History Society* 87: 101–118.
- Dinesen, L. 1998. Priorities for biodiversity conservation in the Udzungwa Mountains, Tanzania, based on bird data. *Journal of East Africa Natural History Society* 87: 195–204.
- Dinesen, L., Lehmborg, T., Svendsen, J.O. & Hansen, L.A. 1993. Range extensions and other notes on some restricted-range forest birds from West Kilombero in Udzungwa Mountains, Tanzania. *Scopus* 17:48–59.
- Dinesen, L., Lahmberg, T., Rahner, M.C. & Fjeldsà, J. 2001. Conservation priorities for the forests of the Udzungwa Mountains, Tanzania, based on primates, duikers and birds. *Biological Conservation* 99: 223–236.
- Fjeldsà, J. 1999. The impact of forest disturbance on the endemic avifauna of the Udzungwa Mountains, Tanzania. *Bird Conservation International*. 9:47–62.
- Fjeldsà, J., Kiure, J., Doggart, N., Hansen, L.A. & Perkin, A. 2010. Distribution of highland birds across a potential dispersal barrier in the Eastern Arc Mountains of Tanzania. *Steenstrupia* 32: 1–43.
- Fry, C.H., Keith, S. & Urban E.K. 1988. *The birds of Africa*. Vol. III. London: Academic Press.
- Fry, C.H. & Keith, S. 2000. *The birds of Africa*. Vol. VI. London: Academic Press.
- IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 26 October 2012
- Jensen, F.P. & Brøgger-Jensen, S. 1992. The forest avifauna of Udzungwa Mountains, Tanzania. *Scopus* 15: 65–83.
- Keith, S., Urban, E.K. & Fry, C.H. 1992. *The birds of Africa*. Vol. IV. London: Academic Press.
- Lovett, J.C. & Wasser, S.K. 1993. *Biogeography and Ecology of the rainforests of eastern Africa*. Cambridge: Cambridge University Press.
- Moyer, D.C. 1992. *Report on the natural resources consultancy for the Udzungwa Forest management Project Preparation Mission*. Dar es Salaam: FBD and DANIDA.
- Newmark, W.D. 1991. Tropical forest fragmentation and local extinction of understory birds in the Eastern Usambara Mountains, Tanzania. *Conservation Biology* 5: 67–78.
- Romdal, T.S., Cordeiro, N.J., Dinesen, L., Fjeldsà, J. & Moyer, D. (2003). The forest birds of Eastern Arc Mountains. Pp 133–145. A manuscript in Romdal, T.S. *Determinants of species distributions along spatial gradients of differing scale: classical similarities and important differences*. Unpublished PhD Thesis, University of Copenhagen.
- Stuart, S.N., Jensen, F.P., & Brøgger-Jensen, S. 1987. The altitudinal zonation of the avifauna in Mwanihana and Magombera forests, eastern Tanzania. *Gerfaut* 77: 165–186.

Stuart, S.N., Howell, K.M., van der Willigen, T.A. & Geertsema, A.A. 1981. Some additions to the forest avifauna of the Uzungwa Mountains, Tanzania. *Scopus* 5: 46–50.

Urban, E.K., Fry, C.H. & Keith, S. 1997. *The birds of Africa*. Vol. V. San Diego: Academic Press.

Chacha Werema

Department of Zoology and Wildlife Conservation, University of Dar es Salaam, Tanzania; Email: cwerema@yahoo.co.uk

Jay P. McEntee

Museum of Vertebrate Zoology and Department of Integrative Biology, University of California at Berkeley, Berkeley, CA, USA

Elia Mulungu

Wildlife Conservation Society, Iringa, Tanzania

Maneno Mbilinyi

Tanzania Bird Atlas, Iringa, Tanzania

Scopus 32: 19–26, June 2013

Received 7 July 2012

Appendix 1. Bird species found in Ikokoto Forest, Udzungwa Mountains (FF = species which are strictly confined to the forest, F = species which mainly depend on the forest but can be found outside the forest. Species with blanks in forest dependence category are non-forest species).

Species	Category
African Goshawk <i>Accipiter tachiro</i>	F
Little Sparrowhawk <i>Accipiter minullus</i>	F
Augur Buzzard <i>Buteo augur</i>	
Common Buzzard <i>Buteo buteo</i>	
Scaly Francolin <i>Francolinus squamatus</i>	F
Lemon Dove <i>Aplopelia larvata</i>	FF
Olive Pigeon <i>Columba arquatrix</i>	FF
Red-eyed Dove <i>Streptopelia semitorquata</i>	
Livingstone's Turaco <i>Tauraco livingstonii</i>	F
White-browed Coucal <i>Centropus superciliosus</i>	
African Wood Owl <i>Strix woodfordii</i>	F
Fiery-necked Nightjar <i>Caprimulgus pectoralis</i>	F
Speckled Mousebird <i>Colius striatus</i>	
Crowned Hornbill <i>Tockus alboterminatus</i>	F
Yellow-rumped Tinkerbird <i>Pogoniulus bilineatus</i>	F
Olive Woodpecker <i>Mesopicos griseocephalus</i>	FF
Lesser-striped Swallow <i>Hirundo abyssinica</i>	
Grassland Pipit <i>Anthus novaeseelandiae</i>	
Common Bulbul <i>Pycnonotus barbatus</i>	
Cabanis's (Placid) Greenbul <i>Phyllastrephus cabanisi</i>	FF
Green-throated Greenbul <i>Andropadus fusciceps</i>	FF
Shelley's Greenbul <i>Andropadus masukuensis</i>	FF
White-chested Alethe <i>Alethe fuelleborni</i>	FF
White-starred Forest Robin <i>Pogonocichla stellata</i>	FF
Olive-flanked Robin Chat <i>Cossypha anomala</i>	FF
Red-capped Robin Chat <i>Cossypha natalensis</i>	F
Stonechat <i>Saxicola torquatus</i>	
Ashy Flycatcher <i>Muscicapa caerulescens</i>	F
White-tailed Crested Flycatcher <i>Elminia albonotata</i>	FF
White-eyed Slate Flycatcher <i>Melaenornis fischeri</i>	F
African Grey Flycatcher <i>Melaenornis microrhynchus</i>	
Forest Batis <i>Batis mixta</i>	FF
Spot-throat <i>Modulatrix stictigula</i>	FF
African Hill Babbler <i>Pseudoalcippe abyssinica</i>	FF
White-bellied Tit <i>Parus aliventris</i>	
African Tailorbird <i>Artisornis metopias</i>	FF
Black-lored Cisticola <i>Cisticola nigriloris</i>	
Red-faced Cisticola <i>Cisticola erythrops</i>	
Brown-headed Apalis <i>Apalis alticola</i>	F
Evergreen Forest Warbler <i>Bradypterus lopezi</i>	FF
Kretschmer's Longbill <i>Macrosphenus kretschmeri</i>	FF
Bar-throated Apalis <i>Apalis thoracica</i>	FF
Uhehe Fiscal <i>Lanius marwitzi</i>	
Yellow White-eye <i>Zosterops senegalensis</i>	F

Species	Category
Collared Sunbird <i>Anthreptes collaris</i>	F
Moreau's Sunbird <i>Nectarinia moreaui</i>	FF
Fülleborn's Sunbird <i>Nectarinia fueelleborni</i>	FF
Malachite Sunbird <i>Nectarinia famosa</i>	
Olive Sunbird <i>Nectarinia olivacea</i>	FF
Variable Sunbird <i>Nectarinia venusta</i>	
Black-backed Puffback <i>Dryoscopus cubla</i>	F
Many-coloured Bushshrike <i>Malaconotus multicolor</i>	FF
Black-headed Tchagra <i>Tchagra senegala</i>	
Fülleborn's Black Boubou <i>Laniarius fueelleborni</i>	FF
Grey-headed Bushshrike <i>Malaconotus blanchoti</i>	
Tropical Boubou <i>Laniarius aethiopicus</i>	
White-necked Raven <i>Corvus albicollis</i>	
Baglafaecht Weaver <i>Ploceus baglafaecht</i>	
Red-faced Crimsonwing <i>Cryptospiza reichenovii</i>	F
Peters's Twinspot <i>Hypargos niveoguttatus</i>	F
African Firefinch <i>Lagonosticta rubricata</i>	
Yellow-bellied Waxbill <i>Estrilda melanotis</i>	
African Citril <i>Serinus citrinelloides</i>	
Yellow-rumped Seedeater <i>Serinus atrogularis</i>	
