Udzungwa Ecological Monitoring Centre
(Udzungwa Mountains National Park)

Annual Technical Report
Year 8 (January - December 2014)

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Cover photo: Udzungwa red colobus, photo by Steffen Brøgger-Jensen

Summary

The Udzungwa Ecological Monitoring Centre (UEMC, please visit the new website realized in 2012 at http://www.udzungwacentre.org) is a facility of the Udzungwa Mountains National Park (UMNP) established at the end of 2006 with the aim of promoting and facilitating biological research and monitoring in order to increase the understanding of the Udzungwa Mountains, and to utilize this information to develop more effective conservation management and community education plans that will improve the long-term conservation of the UMNP and the adjacent Forest Reserves. This is the eighth year technical report (January - December 2014), and it is aimed at presenting the results of monitoring and training activities, and other programmes conducted, as well as summarize the short and medium-term plans so that it can also serve as a strategic document.

Generally, UEMC continued the provision of accommodation and facilitation to national and international researchers, with the overall number of researchers hosted that raised to over 240 people in 2014, including 9 Ph.D. students. Besides the advisory to the Ecology Department of UMNP, training of ecologists and field assistants, and its own monitoring efforts, UEMC continued to facilitate the TEAM project (*Tropical Ecology, Assessment and Monitoring*) that reached the sixth year of annual data collection on climate, arboreal vegetation and terrestrial mammals. By using the hostel for students, UEMC facilitated important training schemes, such as those organized by Pennsylvania State University. UEMC also continued the provision of training scholarships for staff.

UEMC continued the primate and duiker monitoring programme in Mwanihana forest (UMNP) and in the southern Uzungwa Scarp Forest Reserve (USFR), and the results from relative abundance data collected were compared to previous data collected since 2002. The latest set of data raised the amount of data-set to 780 census repetitions in Mwanihana (or 3,068 km walked during 2002-2014), and 329 repetitions in USFR, equivalent to 1,169 km walked. Overall, the clear trend of relative population stability in Mwanihana is confirmed with latest data, while the dramatic decline earlier reported for USFR persists, especially for the colobine monkeys. Conservation recommendations for both forests spanning from the results are proposed, and particularly stress the need for effective ground protection in USFR, which is currently a proposed Nature Reserve but with no ground protection ensured. It is also recommended that the monitoring programme continues with the methodological consistency so fare achieved. This programme represents the longest-term monitoring effort for any biodiversity component in the area. The report also shows the quantity and quality of data collected by the TEAM programme, which also represents a very solid contributes with data collection that is standardized with that of several other field stations in the tropics.

The community conservation programme implemented by MUSE and Association Mazingira continued in 2014 under facilitation of UEMC and in close collaboration with UMNP, and major achievements included: continued the environmental education programme to 13 primary schools and 5 secondary schools; training continued for both tree nurseries and agro forest projects. In this year 2014 6.5 acres were prepared as demonstration block for agro forest projects, the sum of 32500 were prepared, training on bee keeping project (33) and computer training (24).

The reports ends with a summary of activities planned for 2015 in the context of the Memorandum of Understanding that regulates the collaboration between TANAPA and MUSE for the management and objectives of UEMC.

1. Background and report aim

The Udzungwa Ecological Monitoring Centre (UEMC) is a facility of the Udzungwa Mountains National Park (UMNP) that was inaugurated on the 10th of November 2006. The establishment of the UEMC was promoted and funded by MUSE - Science Museum (Trento, Italy) in partnership with Tanzania National Parks (TANAPA). The UEMC has been donated to Tanzania National Parks (TANAPA) and it is managed by MUSE under the conditions stated in a Memorandum of Understanding. The first MoU has run from 2006-2011, and a new MoU was signed in January 2012 for the period 2012-2016. The report aims to present the monitoring data collected and other activities, as well as summarizes the updated short and medium-term plans so that it can also serve as a strategic document. All previous technical reports can be downloaded from the UEMC website (www.udzungwacentre.org).

The aim of the UEMC is to promote and facilitate biological research and monitoring in order to increase the understanding of the Udzungwa Mountains, and to utilize the information to develop more effective conservation management and community education plans that will improve the long-term conservation of the UMNP and the adjacent Forest Reserves/Nature Reserves. Other than providing accommodation and research resources to visiting scientists, the activities originally planned include delivering technical advice to TANAPA (especially UMNP's Ecology Department), implementing monitoring programs, organizing courses for rangers, scouts, park ecologists and university students, promoting school education programs for school children, and networking with other biological field stations in the tropics and organizations supporting monitoring centres.

1.1. Summary of UEMC set-up and personnel

Whilst this is neither a management nor a financial report, the following information are summarized to complete the background to the UEMC functioning. UEMC consists of 6 buildings: one includes an office, store and large seminar room and next to it are three researchers' houses, each with two double rooms. In February 2010, an annexed hostel was inaugurated, consisting of a dormitory block (four rooms each with three double-deck beds) and of a dining hall, with kitchen and two stores. This structure is dedicated to enhancing training capacity.

The staff working at UEMC did not change in 2014 relative to previous year. In addition to MUSE's institutional representative (Dr. Rovero), it included: UEMC coordinator (Philipo Jacob), a school environmental education officer (Alatupoka Sanga), two field technicians, two gardeners, 2 house-keepers and four watchmen. Moreover UEMC hosts the TEAM network project that begun in mid-2009 and is run by a staff of 4 people, including a site manager (Emanuel Martin), 2 field technicians and a driver.

UEMC in 2014 continued to co-fund scholarships for staff training. Thus, Mr. Arafat Mtui - former UEMC coordinator – continued with his studies in Mweka Wildlife College pursuing his B.Sc. degree in Wildlife Management. The bulk of funding for these scholarships was generously donated by Drs. Larry Gorenflo and Brian Orland of Penn State University.

2. Summary of activities planned and activities implemented

This section provides an overview of activities implemented until the end of 2014 against the baseline goals that have been set since 2006 and summarized below (details in previous reports).

1. Provide **advisory and technical assistance to the UMNP/Ecology Department** on all issues related to ecological monitoring.

This fundamental activity continued through the routine primate and duiker monitoring programme and through general advisory for other ecological monitoring activities.

2. Implement **ecological monitoring** protocols in conjunction with the Ecology Department in the UMNP and with the Forestry Division in the Forest Reserves.

UEMC continued the primate monitoring programme both in Mwanihana (UMNP) and in the southern Uzungwa Scarp Forest Reserve (USFR), thus raising data for both TANAPA and Tanzania Forest Service (TFS). This is the longest dataset on biodiversity for the area. Due to the alarming situation of biodiversity destruction found in USFR as highlighted in previous reports, data for USFR are of particular conservation relevance. Moreover, all data collected by the TEAM project in Mwanihana forest within UMNP since 2009 are also readily available (details below).

3. **Facilitate visiting researchers** and conservation agencies through providing accommodation, information, research facilities (Internet, computers, seminar room etc.).

In 2014 UEMC hosted 3 long-term researchers plus a number of guest researchers visiting on shorter term basis, adding up to a total number of around 240 researchers accommodated in the hostel and houses during the 8 years of operations, including 9 Ph.D. students. Overall, the resources raised from fees for accommodation in 2014 contributed to around 50% of UEMC running costs. A dominant portion of these fees was from institutions conducting training at UEMC, notably Penn State University. UEMC continued to facilitate TEAM programme by hosting the staff and providing logistic support.

4. Organize **training courses** in ecological monitoring to rangers, park ecologists and students.

A workshop for park ecologists at national level was conducted in 2013, while no formal training of this sort was conducted in 2014. The international summer school on tropical forest biodiversity, which is also a training opportunity for local staff, was not conducted due to other commitments by the trainers, but it will be resumed in 2015.

5. Organize **education activities for school children**

This programme continued in 2014 thanks to the initiation of a broader community conservation programme led by **Association Mazingira**, a small Italian NGO that works with Trento Museum and in collaboration with Tanzania Forest Conservation Group (TFCG). The 3-year project is implemented in close coordination with the park's Community Conservation Service

and since 2012 has expanded the Environmental Education programme originally conducted with 5 primary schools to an 13 primary schools and 5 secondary schools overall (details in the report).

6. Promote **external collaborations and networking** with other monitoring programmes, ecological centres and field stations in the tropics.

The continuation and consolidation of **TEAM project** (Tropical Ecology, Assessment and Monitoring), with its expanding network of field sites and field stations (currently 17, see www.teamnetwork.org) continue to represent the major contribution towards this goal. Although based at UEMC, this project runs independently of UEMC routine activities. However, given the great relevance to UEMC activities and biodiversity assessment in UMNP, a summary report of activities and data collected is included in this report. Besides TEAM, at local level UEMC continued to facilitate and/or collaborate with Penn State University, Southern Tanzania Elephant Programme (formerly Udzungwa Elephant Project), Udzungwa Forest Project/Flamingo Land, TFCG and other agencies working in the area.

3. Ecological monitoring results: primate and forest antelope monitoring

3.1. Primate monitoring in Mwanihana forest

The Primate Monitoring Program established in 1997 in Mwanihana forest, uses transects established along tourist trails maintained by the park. Details of transect length and habitat types are reported below (Table 1). Transects are repeated every two weeks by one observer that walks slowly (1 km per hour) and records all sightings of primate groups, together with its position, distance to each group, number of individuals (when possible) and observer's position along the transect.

Table 1. Characteristics of four transects used for primate censuses in Mwanihana Forest, Udzungwa Mountains National Park, Tanzania

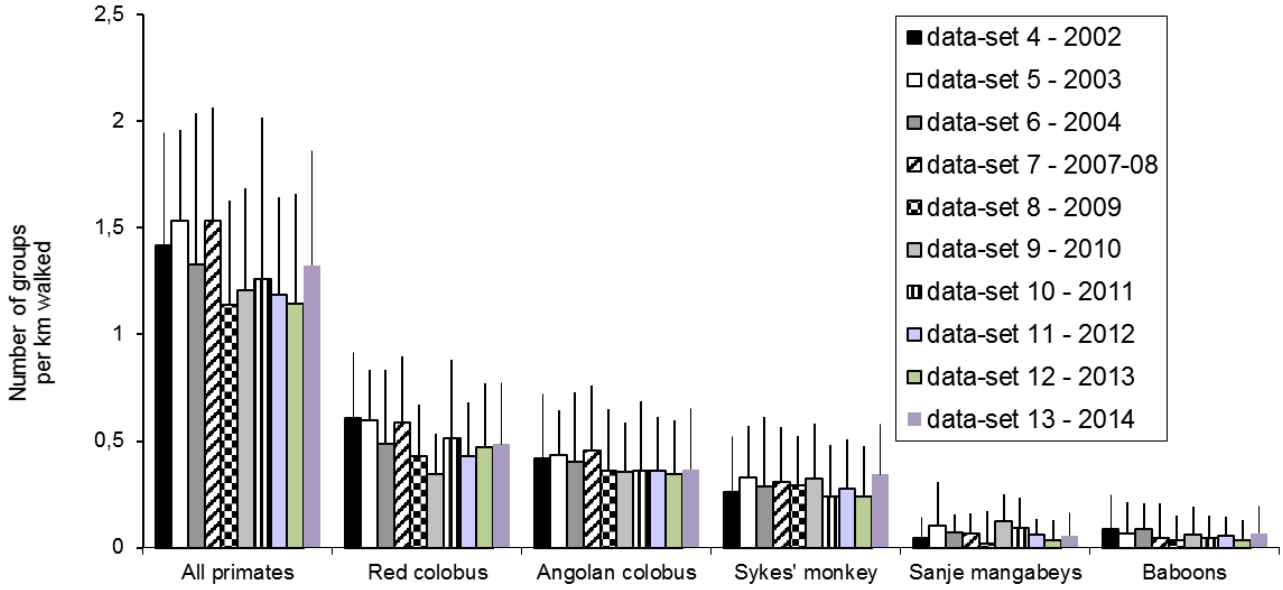
Transect	Length of transect (km)	Altitude	Gross forest type and portion along the line (km)
T1 (Camp Site 3)	4.0	350 - 800	Deciduous (0.8 km), semi-deciduous (0.6 km), open area (0.4 km), evergreen (2.2 km).
T2 (Mwanihana Trail)	4.0	320 - 590	Deciduous (1.4 km), semi-deciduous (0.4 km), evergreen (2.2 km).
T3 (Sanje Falls)	3.7	330 - 700	Mixed deciduous and semi-deciduous (0.8 km), evergreen (2.9 km).
T4 (Msolwa)	4.0	330 - 600	Mixed deciduous and semi-deciduous (1 km), evergreen (3 km).

The updated list of data-sets collected by various observers over the years is presented in Table 2. As elaborated in previous reports, data collected during 1998-2001 were deemed unreliable mainly because inter-observer consistency in data collection was not ensured. Therefore, it was decided not to include these data (which remains available on request), and hence present data from 2002-2014. Inter-observer consistency in data collection has been regularly checked for this data-set, and it was also ensured by minimizing the number of data-collectors.

Table 2. Number of primate censuses conducted by each observer and data-set in Mwanihana Forest, Udzungwa Mountains National Park, Tanzania

N°	Observer	Period	Transect			
			C3	MW	SJ	MSO
4	FR	July 2002 - January 2003	13	14	14	-
5	ASM1	February-August 2003	14	14	13	-
6	ASM2	February-December 2004	20	20	19	-
7	AK (UEMC)	April 2007-August 2008	20	19	20	13
8	ASM3 (UEMC)	December 2008-October 2009	21	21	21	20
9	ASM4 (UEMC)	November 2009-January 2011	28	28	28	28
10	ASM+MK (UEMC)	February 2011-January 2012	23	23	23	23
11	MK (UEMC)	February 2012 - December 2012	22	22	22	22
12.	PJ+MK	January 2013 – December 2013	24	24	24	24
13.	PJ+MK	January 2014 - December 2014	24	24	24	24
	All observers		209	209	208	154

The updated data-set 2002-2014 for Mwanihana consists overall of 780 transect repetitions, for over 3,068 km walked. This remains the largest and longer-term monitoring data-set available for the area. The update results summarized as primate groups' encounter rate (number/km) and pooled for all transects are shown in the chart below. We do not show here the transect-specific results as we are mainly here concerned with the overall temporal trends, while site-specific variations are more relevant to habitat differences among transects.



3.2. Primate monitoring in Uzungwa Scarp Forest Reserve

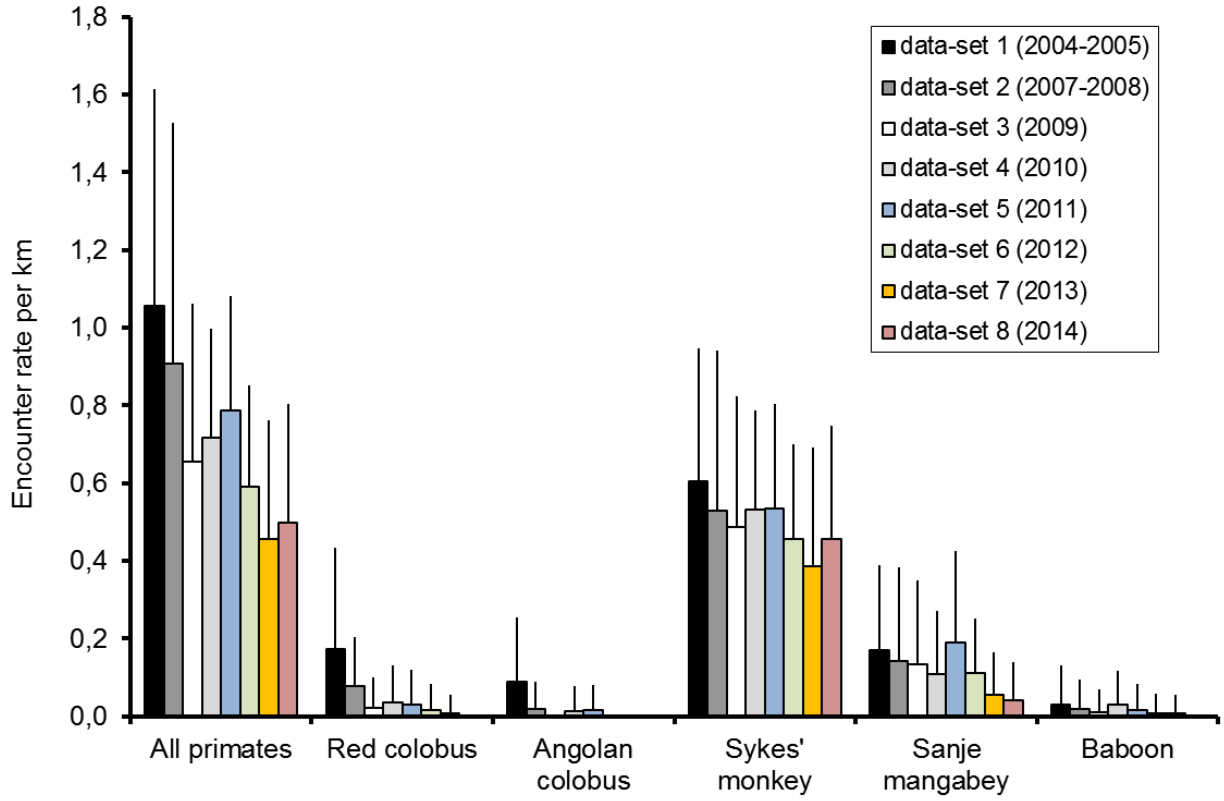
The same line-transect technique and sampling design used for censuring primates in Mwanihana was also used in the Uzungwa Scarp Forest Reserve (USFR) beginning in 2004 by F.R. and continued by UEMC coordinators and field technicians (Table 4). Effort by end of 2014 totalled 329 repetitions, equivalent to 1,169 km walked. One high-elevation transect (Kitolomero) was only used in 2004 and could not be repeated for the difficult access. JKT transect was forced to be closed by the military station nearby, and it was therefore replaced by Tazara transect, which samples an equivalent portion of forest in terms of habitat and elevation zone.

Table 4. Number of primate censuses conducted by each observer and data-set in Uzungwa Scarp Forest Reserve

N	Observers	Period	Ikule	Mkaraji	JKT	Kitolomero	TAZARA	ALL
1	FR+ASM	July 2004 - June 2005	23	21	22	20	Na	86
2	AMANI	January 2007 - June 2008	14	14	10	Na	Na	38
3	ASM	January 2009 - September 2009	9	9	Na	Na	7	25

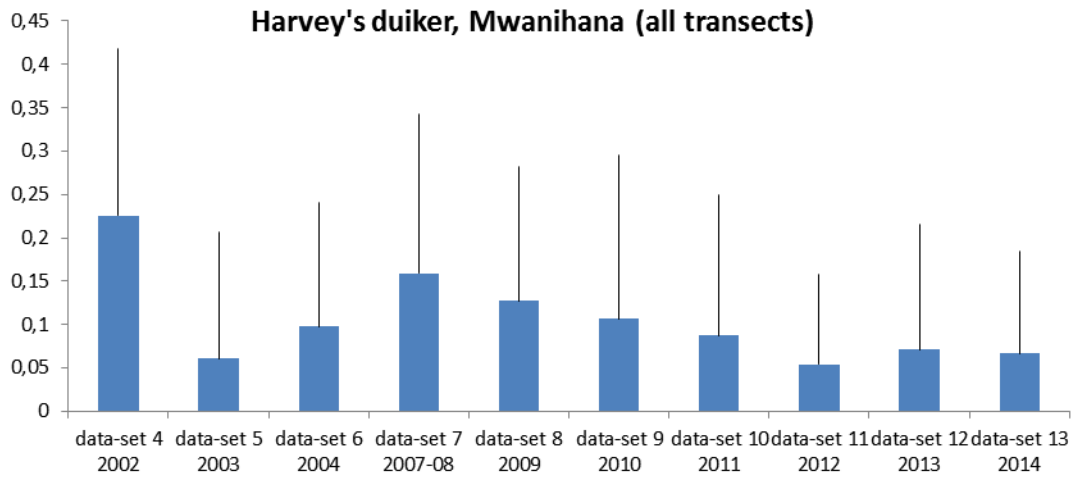
4	ASM	October 2009-January 2011	13	13	Na	Na	13	39
5	ASM+MK	February 2011 -January 2012	12	12	Na	Na	12	36
6	ASM	February 2012 - December 2012	11	11	Na	Na	11	33
7	MK+PJ	January 2013 - December 2013	12	12	Na	Na	12	36
8	MK + PJ	January 2014 - December 2014	12	12	Na	Na	12	36
	All		106	104	32	20	67	329

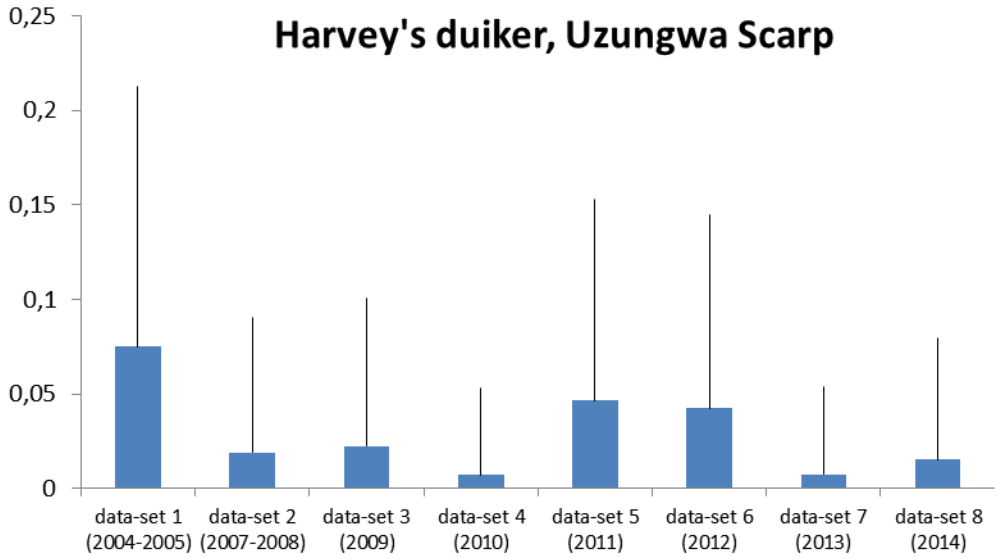
As for Mwanihana, the chart below shows the updated summary of encounter rate with time for the four transects pooled. As elaborated below, the persistent absence of colobine monkeys is critical and indicates of continued decline for these primates.



3.3. Monitoring of Harvey's duiker in Mwanihana and Uzungwa Scarp Forest Reserve

The red duiker is seen frequently enough from transects to allow for plotting encounter rate for the pooled transects. Despite the sample size is small, especially for Uzungwa Scarp, the chart below do allow for a qualitative assessment of the status and trends of these populations, with a clear, lower relative abundance in Uzungwa Scarp compared to Mwanihana.





3.4. Interpretation of monitoring results

The increased sample size allow to consolidate the conclusions highlighted in previous years on the status of primates and the red duiker in the target forests, that is, a relatively stable trend for diurnal primates in Mwanihana and a dramatic decline in Uzungwa scarp, which is especially evident for the colobus monkeys. Indeed, the method used is much more suitable for the 3 arboreal monkeys (colobus and Skykes') and less informative for the terrestrial mangabeys and the baboons. Selective hunting of colobus in Uzungwa scarp, coupled with forest degradation, is the well documented cause of this decline as highlighted in previous reports and a number of papers. This situation calls for urgent, ground protection of this southern forest, and at the time of writing this report there is hope that the newly established Uzungwa Scarp Nature Reserve can become operational.

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RESEARCH ARTICLE

Primates Decline Rapidly in Unprotected Forests: Evidence from a Monitoring Program with Data Constraints

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Abstract

Growing threats to primates in tropical forests make robust and long-term population abundance assessments increasingly important for conservation. Concomitantly, monitoring becomes particularly relevant in countries with primate habitat. Yet monitoring schemes in these countries often suffer from logistic constraints and/or poor rigor in data collection, and a lack of consideration of sources of bias in analysis. To address the need for feasible monitoring schemes and flexible analytical tools for robust trend estimates, we analyzed data collected by local technicians on abundance of three species of arboreal monkey in the Udzungwa Mountains of Tanzania (two *Colobus* species and one *Cercopithecus*), an area of international importance for primate endemism and conservation. We counted primate social groups along eight line transects in two forest blocks in the area, one protected and one unprotected, over a span of 11 years. We applied a recently proposed open metapopulation model to estimate abundance trends while controlling for confounding effects of observer, site, and season. Primate populations were stable in the protected forest, while the colobines, including the endemic Udzungwa red colobus, declined severely in the unprotected forest. Targeted hunting pressure at this second site is the most plausible explanation for the trend observed. The unexplained variability in detection probability among transects was greater than the variability due to observers, indicating consistency in data collection among observers. There were no significant differences in both primate abundance and detectability between wet and dry seasons, supporting the choice of sampling during the dry season only based on minimizing practical constraints. Results show that simple monitoring routines implemented by trained local technicians can effectively detect changes in primate populations in tropical countries. The hierarchical Bayesian model formulation adopted provides a flexible tool to determine temporal trends with full account for any imbalance in the data set and for imperfect detection.

OPEN ACCESS

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A major analysis of the primate data was published earlier in 2015 in PloS ONE (Rovero et al., 2015; see first page reported above) using an advanced statistical approach that allowed to decipher temporal trends of estimated abundance with consideration of detectability. The analysis confirmed the significant decline in Uzungwa Scarp for colobine monkeys and the stability in Mwanihana. It also allowed to determine that variation among observers that collected data over the years do not affect the temporal trend; and that differences in abundance between dry and wet season were not significant. These results are very important as they indicate that the simple monitoring routine is indeed effective at deciphering temporal trends of threatened primate populations despite involving several observers.

4. TEAM project (Tropical Ecology, Assessment and Monitoring) in Mwanihana

Since its establishment in 2009 in the Udzungwa Mountains, TEAM project (www.teamnetwork.org) continued by conducting its sixth year of sampling. Three standardized monitoring protocols are implemented solely in Mwanihana forest: terrestrial vertebrates, vegetation and climate (see previous reports for more details).

Terrestrial vertebrates: 60 camera-trap points have been re-deployed through sampling 3 arrays of 20 camera-trap sites, sequentially. Twenty digital camera-traps (model Reconyx RM 45 Rapid Fire and Reconyx HP 500) have been used, each set to work for 30 days. The camera-trap were distributed at a density of 1 camera every 2 km^2. Locations were pre-loaded in a GPS unit and actual points were located in the field by the field team. The final locations of the camera-traps were chosen upon the presence of wildlife trails and other signs. Sampling overall took place during July to November 2014.

It is here presented an overview of type and quality of the data collected, along with summarize results. It is recalled that TEAM network makes data freely available on the web portal (http://www.teamnetwork.org/data/query), and therefore analysis and publication of results may be done at later stage and not by the applicant, depending of type of data and research questions being asked. However, the applicant is involved in more detailed analysis of camera-trapping data for which details and relevant references are given.

Table 5 presents a synthesis of results from camera-trapping for 2009-2014 sampling. Over 12,000 images were produced each year, however given that cameras shoot in continuous (thus the same individual animals would be photographed more than once within minutes), data are first screened to calculate the number of images per day and/or per hour depending in subsequent analysis (deemed independent events).

Table 5. Sampling effort and summary results for TEAM's terrestrial vertebrate sampling during 2009-2013.

	2009	2010	2011	2012	2013	2014
Num of camera set	60	60	60	60	60	60
Num of cameras functional	58	59	59	60	59	59
Camera-trap days (24 h periods)	1818	1874	1829	1842	1818	1812
Mean camera-trap days per camera	31.3	31.8	31	30.7	30.8	30.8
Total number of events (1-hr interval)	1395	1766	1593	1523	1941	2197
Total mammal species recorded	27	27	28	25	26	28

Descriptive analysis revealed that with 32 species trapped overall, a very high portion of the mammalian community known for Udzungwa was recorded in Mwanihana, the cumulative checklist being presented in Table 6. Trap-rate (number of events per sampling effort) is used as a gross index of relative abundance and allows to highlight those species that are most frequently encountered (the top 5 species trapped in decreasing order are: giant-pouched rat bushy-tailed mongoose, Harvey's duiker, Sanje mangabey and grey-faced sengi or elephant-shrew).

Table 6. List of mammals camera-trapped by the TEAM project and photographic events per year (2009-2014).

Common name	Latin name	2009	2010	2011	2012	2013	2014
Marsh mongoose	*Atilax paludinosus*	3	3	13	5	6	4
Bushy-tailed mongoose	*Bdeogale crassicauda*	130	308	295	318	419	352
Harvey's duiker	*Cephalophus harveyi*	367	250	271	380	394	476
Abbott's duiker	*Cephalophus spadix*	60	53	56	30	52	51
Sanje mangabey	*Cercocebus sanjei*	73	100	118	152	129	149
Sykes' monkey	*Cercopithecus mitis*	22	9	12	21	19	26
African civet	*Civettictis civetta*	1	NA	NA	NA	NA	NA
Angolan colobus	*Colobus angolensis*	1	2	1	2	3	1
Giant pouched-rat	*Cricetomys gambianus*	276	353	380	313	443	601
Spotted hyena	*Crocuta crocuta*	NA	4	3	NA	NA	NA
Tree hyrax	*Dendrohyrax validus*	23	42	36	50	57	32
Lowe's genet	*Genetta servalina*	18	64	54	59	37	67
Human	*Homo sapiens*	2	3	NA	1	NA	NA
Hystrix	*Hystrix africaeaustralis*	11	1	NA	2	NA	2
Serval cat	*Leptailurus serval*	NA	NA	1	NA	NA	NA
Savannah elephant	*Loxodonta africana*	11	5	7	13	9	5
Honey badger	*Mellivora capensis*	7	6	7	13	12	10
Banded mongoose	*Mungos mungo*	2	7	1	NA	2	9
African palm civet	*Nandinia binotata*	2	7	9	11	9	6

Suni	*Nesotragus moschatus*	114	135	91	87	165	210
Leopard	*Panthera pardus*	8	2	7	6	3	4
Yellow baboon	*Papio cynocephalus*	3	NA	2	NA	1	3
Tanganyika mountain squirrel	*Paraxerus vexillarius*	46	60	59	40	59	78
Four-toad sengi	*Petrodromus tetradactylus*	3	7	36	12	15	1
Bushpig	*Potamochoerus larvatus*	18	23	16	22	24	44
Udzungwa red colobus	*Procolobus gordonorum*	5	2	8	2	3	2
Chequered sengi	*Rhynchocyon cirnei*	4	4	8	NA	1	6
Grey-faced sengi	*Rhynchocyon udzungwensis*	45	88	95	61	69	52
African buffalo	*Syncerus caffer*	4	5	3	3	7	1
Cane rat	*Thryonomys swinderianus*	NA	NA	2	4	1	1
Bushbuck	*Tragelaphus scriptus*	NA	4	2	8	2	3
	Species richness	**27**	**27**	**28**	**25**	**26**	**28**

Since 2012, a consistent effort to analyse data begun. This included descriptive analysis, species-specific analysis and occupancy modelling, allowing for determining presence/absence of species under a rigorous statistical framework. An example of results for the grey-faced sengi or elephant-shrew is in Rovero et al. (2014 PloS ONE: http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0103300). The core species' modelling analysis uses occupancy (sites occupied on sites sampled) as the state variable of abundance and allows for assessing the influence of environmental covariates. For example, in Fig. 4 (above) a spatially-explicit model of the Sanje mangabey is shown, indicating that this endemic monkey prefers highly the montane forest versus the lowland forest. In the chart below, instead, is an example of result of community analysis, whereby the species richness is estimated using a Bayesian framework that allows to estimate species with account for imperfect detection. The chart shows that while the observed species richness is typically around 26-27 (varying little every year), the true number of species is above 30 (32-34) which fits with evidence using various methods.

Besides single-season and site-specific analyses, the currently initiated task is to analyze temporal dynamics (i.e. species and community changes over time) at community and species level, which after 5 year of monitoring is expected to begin to be informative on community changes. As already reported, moreover, TEAM data have the great advantage of being comparable to other sites across the tropics. Indeed the first published analysis of data conducted collaboratively with the TEAM network office was published in 2011 and has been a comparison of 7 sites in three continents (Ahumada et al. 2011), and meanwhile more analysis have been published or are in preparation using both the camera trapping and the vegetation data.

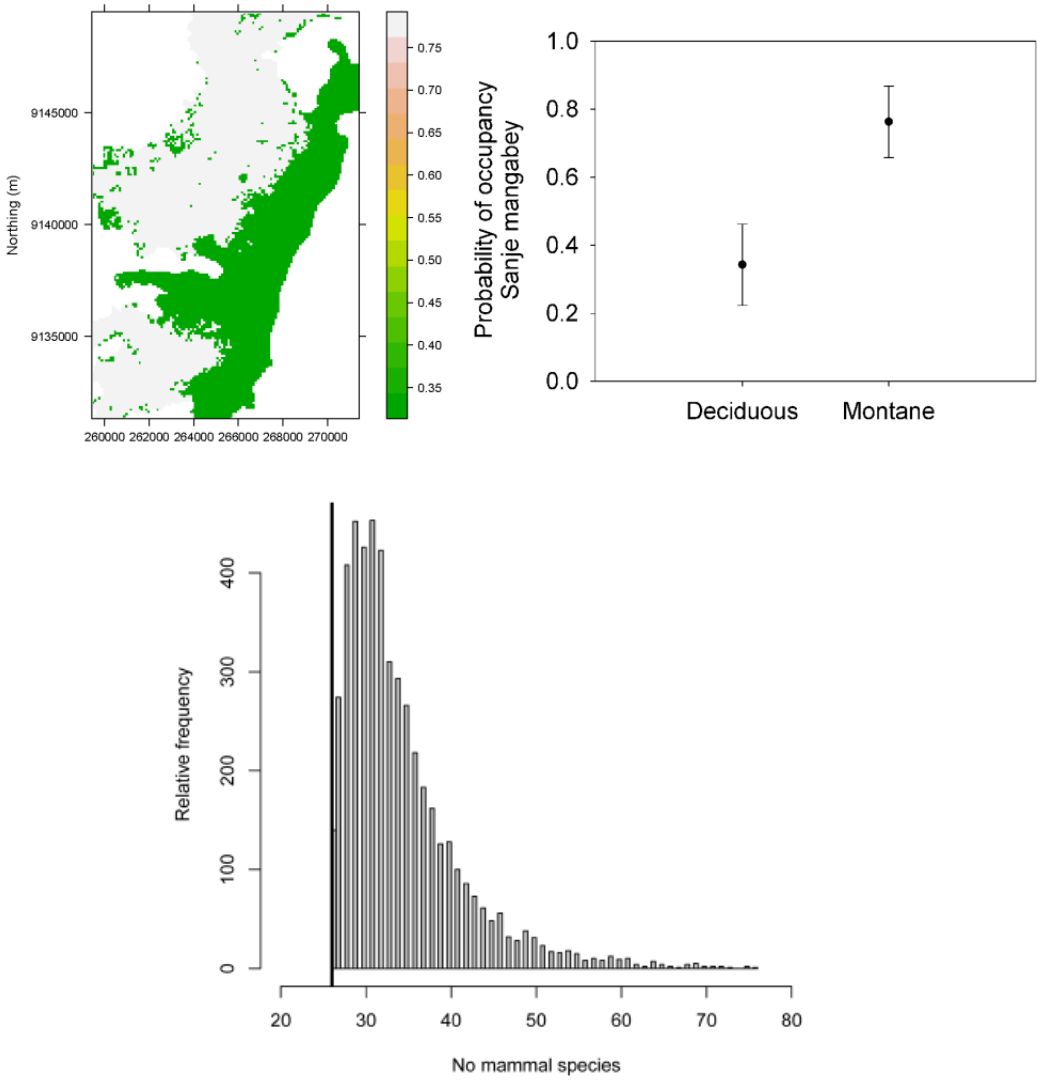

Chart above left: occupancy model for the Sanje mangabey in Mwanihana forest. Right: occupancy probability values (and S.E.) in deciduous and montane forest. Below: distribution of the estimated species richness using data from 2009 according to a Bayesian modeling framework (from Rovero et al. 2014).

Vegetation: all trees and lianas above 10 cm DBH in the 6 vegetation plots (each 1 ha) were re-measured in 2014. Since 2009, a total number of 57 families which include 103 genera have been identified. The plots are located at different altitudes in order to capture variations within

Mwanihana forest. Sampling was conducted in October-November 2014 as it was the case with previous samplings since 2009.

Comparisons of number of families and species recorded amongst the 6 plots in 2014 are shown in the Table below: the number of families ranged from 15 -35 (mean = 24) while that of species ranged from 22-56 (mean = 40).

Plot (name and altitude)	**Number of families**	**Number of species**
Plot 1 (Gologolo chini) 1127 m a.s.l	**22**	**42**
Plot 2 (Gologolo juu) 1795 m a.s.l	**29**	**49**
Plot 3 (Sanje chini) 778 m a.s.l	**15**	**22**
Plot 4 (Sanje juu) 1425 m a.s.l	**35**	**56**
Plot 5 (Campsite Chini) 781 m a.s.l	**18**	**27**
Plot 6 (Campsite juu) 1519 m a.s.l	**26**	**45**
Total	**57**	**131**

For 2014 data, DBH size classes distribution was also done and the results are shown below. As it was expected, majority of trees and lianas falls in the 10-20 cm DBH class, with the number of stems per class decreasing for larger size classes.

DBH class (cm)	**Num. of stems**						
	Plot 1	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Total**
10=20	317	284	277	460	261	361	1960
20=30	38	94	81	129	110	121	573
30=40	34	62	44	40	43	49	272
40=50	31	45	23	24	23	41	187
50=60	13	23	10	22	13	10	91
60=70	9	10	12	15	3	5	54
70=80	6	6	6	7	5	7	37
80=90	4	9	8	1	2	9	33
90=100	5	3	3	6	1	1	19
>100	8	6	4	6	1	6	31

Climate monitoring: Through the use of an automatic weather station, TEAM project continued to collect data on four weather parameters namely rainfall, solar radiation, temperature and relative humidity. Once the data have been retrieved from the datalogger, they immediately become uploaded into TEAM website http://www.teamnetwork.org/data/query for public consumption freely of charge but after adhering to the TEAM data use policy.

5. School education and community conservation activities

Activities with schools ranged from lessons in class and visits to the park and night cinema projections. UEMC initiated this programme towards the end of 2007 with 13 nearby primary schools in Mang'ula, namely Mlimani, Mwaya, Mgudeni, Mang'ula A and Msalise primary schools. Ichonde, Kisawasawa, Sanje, Kiberege, Darajani, Udzungwa, Tumaini, and Sonjo and 5 were secondary school (St. Mary secondary school, Bokela, Kisawasawa, Udzungwa, and Mang'ula: class lessons on environmental education were carried out regularly, and other activities included continuing school trees nurseries, tree planting around the schools, study tours, computer and bee keeping training. The environmental programmes worked with standard 5 and 6 classes in each school, each class receiving one teaching period of 40 minutes per week. The average number of students per class was 150, so UEMC roughly reached 3,220 students in 2014.

Photographs above: part of project's activities, twininng, forest safaris and nursery preparations.

With the support of UMNP, UEMC has been taken one class from every school on a field trip to hike in the National Park. Also UEMC has been doing the same to take them to the plantation forest to see the differences between plantation and natural forests. Trips were greatly appreciated by the students, and they involved about 40 students and two school teachers each time. Also UEMC in connection to Association Mazingira extended its programs to communities where 14 villages (Signali, Nkasu, Kiberege, Kisawasawa, Ichonde, Mgudeni, Mwaya, Mang'ula A, Mang'ula B, Sole, Sonjo, Mkula, Sanje and Msufini, were visited and environmental education were provided.

In addition, other community conservation components have been activated, as follows:

- preparation of seedlings and planting in agro forests plots (36,045)
- training on bee keeping (33)
- computer training to environmental education teachers from the 17th schools (24teachers)
- Energy serving stoves, briquettes and mud stoves

The project plans also include support to the park for boosting tourism promotion.

5.1 Construction of the Visitor Information Centre

In 2014 the construction of the Visitor Information Centre (VIC) begun. This major contribution by MUSE an other partners including Association Mazingira fulfils TANAPA interest into realizing a VIC in each park. After introductory meetings and informal technical agreements on the procedures to follow, a proper formal Memorandum of Understanding was signed between Association Nadir/MUSe (Nadir is the Italian NGO that received the funding with MUSE and other partners) and TANAPA. An Environmental Impact Consideration was prepared by TANAPA Acting Park Ecologist and signed by TANAPA headquarters. A dedicated project bank account was opened at CRDB bank, Kilombero branch, with the double signature of TANAPA and UEMC/Mazingira on behalf of Nadir. Project money was deposited into the account.

The Italian architect Dr. Flavio Ridolfi visited the building site for a general inspection and final surveys to update and edit the project drawings. In fact the site was staked and surveyed to start clearing the area from trees and shrubs. Labourers to clear the area were selected and employed. A strategic working plan was prepared by the Italian architect and TANAPA engineer. The bill of quantities was presented to TANAPA staff who agreed to edit it according to the current Tanzanian prices of materials and labor force.

The Hydraform machine to construct the eco-friendly bricks was inspected by the Chief Park Warden at Mikumi National Park and plans were made to service and bring it to the Udzungwa Mountains National Park. Below is a photograph of the construction site.

The Visitor Information Centre construction site

6. Activities planned for 2015 and strategic planning

UEMC plans to conduct the following activities in 2015:

- continue the primate and duiker monitoring with the standard, monthly frequency in Mwanihana and USFR;
- continuation of the VIC construction in alliance with TANAPA and other partners, with an aim of finishing the building in 2016 and preparation of designs for the interiors completed by early 2016; the ultimate goal is to inaugurate the VIC in 2017 (25th anniversary of the establishment of the park);
- continue to support with technical advisory and training the park-wide monitoring of mammals and help establishing a sustainable system that can ensure data-collection; this include conducting the fourth edition of the summer school that will be open to TANAPA ecologists from UMNP and elsewhere;
- continue to support and facilitate the environmental education programme and the environmental cooperation activities by Association Mazingira, which during 2015 gets to its final year;
- continue and consolidate implementation of TEAM project, that will enter into its seventh year of data collection;

UEMC also plans to consolidate the long-term collaboration with other institutions and programmes operating in the area, the Natural History Museum of Denmark and the Pennsylvania State University in primis, towards developing common way forward for the

long-term support to UEMC, in collaboration with TANAPA, as a facility that remains of critical importance for maintaining and bosting research and conservation efforts in Udzungwa. This is especially relevant at times of rapid changes in the Kilombero valley as related to agricultural and infrastructural developments, as well as population growth, representing a potential increasing threat to the outstanding biodiversity and the associated ecosystem services provided by the park and other protected areas.