

AMPHIBIAN AND REPTILE DIVERSITY IN THE SOUTHERN UZUNGWA SCARP FOREST RESERVE, SOUTH-EASTERN TANZANIA

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Abstract: The Udzungwa Scarp Forest Reserve is one of the largest forest patches within the Udzungwa Mountains of South-central Tanzania. It covers an area of about 200 km² on the south eastern slopes of Udzungwa range.

Since 1998 five sites in the southern part of the Udzungwa Scarp Forest Reserve, ranging from 400 to 1900 m a.s.l., have been surveyed and a list of Reptiles (33 species) and Amphibians (36 species) is given. Among them 21.7% and 53.6% of the species are endemic or near endemic to the Udzungwa Mountains and to the Eastern Arc Mountains respectively. Concern is raised for the preservation of this unique highland forest-dependent fauna in the light of continuing habitat alteration.

Key words: Eastern Arc; Udzungwa mountains; Udzungwa Scarp; checklist; Amphibians; Reptiles

1. INTRODUCTION

The Udzungwa Scarp Forest Reserve covers part of the south-eastern slopes of Udzungwa Mountains, which contain large forest reserves within the “Eastern Arc Mountains and Coastal forests of Kenya and Tanzania” biodiversity hotspot. It covers an area of about 200 km² and an elevation range of about 1,850 m, between 250 and 2,100 m. The Reserve is part of the Eastern Arc chain of isolated blocks of mountains stretching from Southeast Kenya through south central Tanzania. The abrupt eastern slopes of these mountains are covered by dense rainforest, and are well known for their

extremely elevated level of biodiversity (Howell, 1993; Burgess et al., 1998; Myers et al., 2000; Newmark, 2002). In spite of this, few massifs have been sampled adequately for biodiversity, and many others are even lacking checklists (Howell, 2000). This contribution presents a preliminary list of herpetological species based on literature and original records collected by the authors in five forest sites between 1998 and 2004.

2. STUDY SITE

The Udzungwa Scarp Forest Reserve lies in south eastern Tanzania, Kilolo and Kilombero Districts, Iringa and Morogoro Regions. All species herein reported have been recorded both within the Udzungwa Scarp Forest Reserve and in neighbouring areas, these latter are a mosaic of scattered cultivated fields and highly disturbed forest patches, surrounding several villages at altitude of 1,500 - 1,900 m a.s.l.

Rainfall in the study area is unimodal in pattern and ranges from 1,800 and 3,000 mm per year (Shangali et al., 1998). Overall, the study sites are located at different elevations giving a sampled altitudinal range 400 – 1900 m. In all but one case (Kihanga), sampling sites were characterised by the presence of closed canopy rainforest, open areas and ecotone both of anthropogenic and natural origins.

Table 1. Location and main characteristics of the sampling sites within the Udzungwa Scarp Forest reserve. D = day search; N = night search; PFT = pit fall traps with drift fences

Sampling site	UTM coordinates	Elevation range m asl	Main vegetation Type	Main habitats investigated	Collecting methods*
Site 1 W of Chita	36L0818688 9056144	700-1000	Submontane rain forest	closed canopy forest, open wetland, ecotone	D, N, PFT
Site 2 SE of Ihimbo	36L0818777 9060770	1400-1600	Montane rain forest	closed canopy forest, open wetland, ecotone	D, N
Site 3 'Mkalazi'	36L0828439 9070696	1100-1200	Submontane rain forest	closed canopy forest, small wetland	D, N
Site 4 'Kihanga'	36L0828078 9073188	1800-1900	Montane rain forest	closed canopy forest	D-N-PFT
Site 5 'Mkaja'	36L0826838 9076662	1800	Open montane wetland	bamboo forest, open wetland, ecotone	D, N
Village belt		1500-1900	Farmland	Synantropic habitats	Opportunistic

Five forest vegetation types are present in the Udzungwa Scarp (Shangali et al. 1998) but just four were encountered at the sampling sites: lowland rainforest (300-800 m a.s.l.); submontane rainforest (700-1,400 m a.s.l.); montane rainforest (1,400-1,800m a.s.l.) and mountain bamboo forest (Table1).

3. METHODS

Five sites were sampled extensively (see Fig. 1), mainly by SSS (systematic sampling surveys) and by means of pit fall traps with drift fences. Searches were conducted both during the day and by night to sample the highest number of species. Further records were obtained from local people living in the villages at the forest edge, from opportunistic searches and from literature. Only direct records have been considered for running the analysis of similarity (Legendre et al., 1998). All collected specimens were

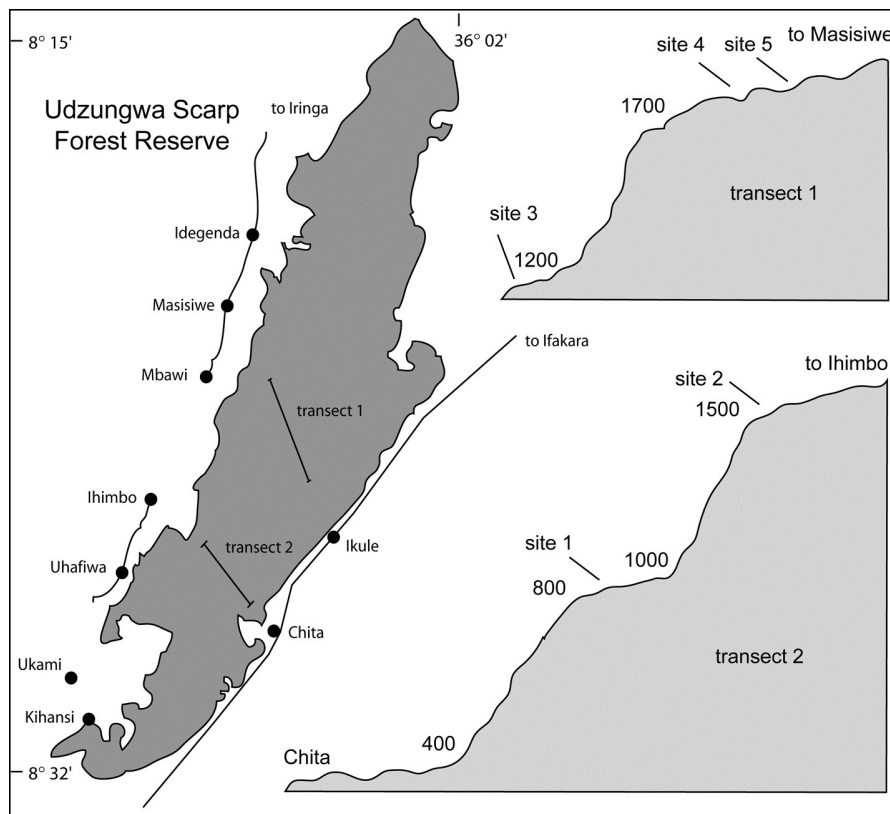


Figure 1. Location of the sampling sites within the Udzungwa Scarp Forest Reserve.

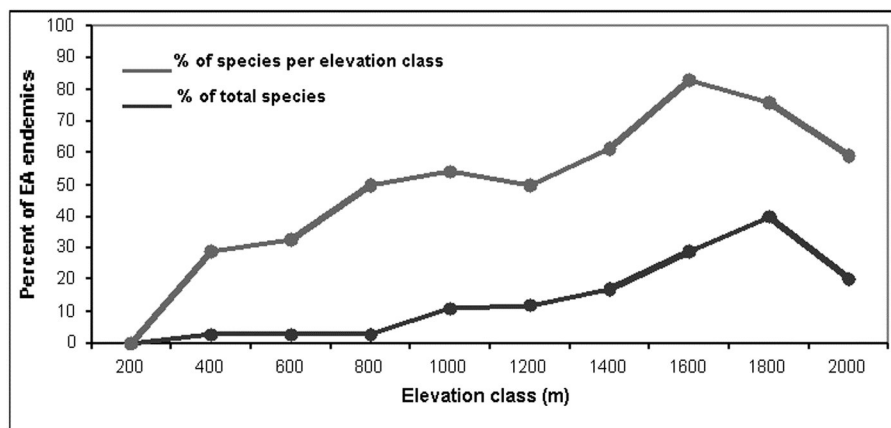


Figure 2. Curves representing the percentage of Eastern Arc endemics and of total species recorded per elevation class in the Udzungwa Forest Reserve (data shown here are the pooled records from the 5 sites reported in table 1 and from opportunistic sampling).

deposited in the collections of the Dept. of Zoology and Marine Biology, University of Dar es Salaam, Dar es Salaam, Tanzania, and specimens, photographs and sound recordings in the Museo Tridentino di Scienze Naturali, Trento, Italy.

4. RESULTS AND DISCUSSION

A total of 36 species of amphibians belonging to six families and 33 species of reptiles belonging to seven families were recorded (Table 2). Among them 21.7% and 53.6% of the species are endemic or near endemic to the Udzungwa Mountains and to the Eastern Arc Mountains respectively.

Some species have never been reported before or were known only from one or a few records from the Udzungwa Mountains. *Cnemaspis dickersoni* (Schmidt, 1919) and *Dipsadoboa weneri* (Boulenger, 1897) were cited from just one record by Perret (1986) and Rasmussen (1997) respectively, and are here confirmed. *Scelotes uluguruensis* (Barbour & Loveridge, 1928) is reported here for the first time from the Udzungwa Mountains. Moreover *Afrivalus* sp. and *Arthroleptis* sp. are believed to be undescribed taxa on morphological and bioacoustical grounds.

In Udzungwa Mountains, the percentage of endemic or near endemic species increases with increasing elevations (Fig. 2). This suggests that several endemic and forest-associated species of the Udzungwa Scarp could be cool-adapted species *sensu* Poynton (2000). According to the Bray Curtis indexes of similarity (Fig. 3) the lowest elevation site (site 1, W of Chita)

Table 2. List of the Udzungwa Scarp Forest Reserve herpetofauna. Species marked with an asterisk are cited in the bibliography or have been collected opportunistically in the village belt surrounding the Forest Reserve or outside the sampling sites, either by local people or by authors. Remaining species have been collected at the sampling sites by the authors and have been considered for running the similarity analysis

	Site 1	Site 2	Site 3	Site 4	Site 5
AMPHIBIA					
ANURA					
ARTHROLEPTIDAE					
<i>Arthroleptis affinis</i> (Ahl, 1939)	+	+	+	+	+
<i>Arthroleptis reichei</i> (Neiden, 1910)		+	+	+	
<i>Arthroleptis stenodactylus</i> Pfeffer, 1893	+		+		
<i>Arthroleptis xenodactyloides</i> (Hewitt, 1933)	+	+	+	+	+
<i>Arthroleptis sp. n.</i>			+		+
<i>Arthroleptis sp.</i>			+		
BUFONIDAE					
<i>Bufo brauni</i> (Neiden, 1910)			+		
<i>Nectophrynoides tornieri</i> (Roux, 1906)	+		+		
<i>Nectophrynoides poyntoni</i> Menegon, Salvidio & Loader, 2004			+		
<i>Nectophrynoides viviparus</i> (Tornier, 1905)				+	+
<i>Nectophrynoides asperginis</i> Poynton, Howell, Clarke & Lovett, 1998*					
<i>Nectophrynoides wendyae</i> Clarke, 1988		+			
HYPEROLIDAE					
<i>Afrixalus morerei</i> Dubois, 1985					+
<i>Afrixalus uluguruensis</i> (Barbour & Loveridge, 1928)		+		+	+
<i>Afrixalus sp. n.</i>		+			
<i>Hyperolius kihangensis</i> Schiøtz & Westergaard, 1999				+	
<i>Hyperolius puncticulatus</i> (Bocage, 1895)	+	+	+	+	+
<i>Hyperolius mitchelli</i> (Loveridge, 1953)			+		
<i>Hyperolius cf. spinigularis</i> (Stevens, 1971)				+	+
<i>Hyperolius sp.</i>				+	
<i>Leptopelis barbouri</i> Ahl, 1929		+	+	+	+
<i>Leptopelis parkeri</i> Barbour & Loveridge, 1928			+	+	
<i>Leptopelis uluguruensis</i> Barbour & Loveridge, 1928	+		+	+	
<i>Leptopelis vermiculatus</i> (Boulenger, 1909)		+			+
<i>Leptopelis flavomaculatus</i> (Günther, 1864)	+				
<i>Phlyctimantis keithae</i> (Schiøtz, 1975)*					
MICROHYLIDAE					
<i>Probreviceps macrodactylus</i> (Nieden, 1926)	+		+	+	
<i>Probreviceps rungwensis</i> (Loveridge, 1932)		+		+	
<i>Spaeleophryne methneri</i> (Ahl, 1924)*					
RANIDAE					
<i>Afrana angolensis</i> (Bocage, 1866)			+	+	+
<i>Arthroleptides yakusini</i> Channing, Moyer & Howell, 2002	+		+	+	
<i>Strongylopus fuelleborni</i> (Nieden, 1910)					+
<i>Phrynobatrachus uzungwensis</i> (Grandison & Howell, 1983)		+	+	+	
<i>Phrynobatrachus parvulus</i> (Boulenger, 1905)				+	
<i>Phrynobatrachus rungwensis</i> Loveridge, 1932				+	

Table 2. (continued)

	Site 1	Site 2	Site 3	Site 4	Site 5
APODA					
SCOLECOMORPHIDAE					
<i>Scolecormorphus kirkii</i> Boulenger, 1883		+		+	
REPTILIA					
SQUAMATA					
GEKKONIDAE					
<i>Cnemaspis uzungwae</i> Perret, 1986	+		+		
<i>Cnemaspis dickersoni</i> (Schmidt, 1919)	+				
SCINCIDAE					
<i>Melanoseps uzungwensis</i> Loveridge, 1942					+
<i>Melanoseps loveridgei</i> Brygoo & Roux-Estève, 1982		+			+
<i>Scelotes uluguruensis</i> (Barbour & Loveridge, 1928)	+				
<i>Trachylepis varia</i> (Peters, 1867)		+			+
<i>Trachylepis maculilabris</i> (Gray, 1845)	+				
CHAMAELEONIDAE					
<i>Bradypodion oxyrhinum</i> (Klaver & Böhme, 1988)					+
<i>Chamaeleo werneri</i> (Tornier, 1899)					+
<i>Chamaeleo tempeli</i> (Tornier, 1899)*					
<i>Chamaeleo laterispinis</i> (Loveridge, 1932)*					
<i>Rhampholeon moyeri</i> Menegon, Salvidio & Tilbury, 2002		+	+		+
<i>Rhampholeon brevicaudatus</i> (Matschie, 1892)	+				
TYPHLOPHIDAE					
<i>Rhinotyphlops nigrocandidus</i> Broadley & Van Wallach, 2000					+
COLUBRIDAE					
<i>Lycophidion capense jacksoni</i> Boulenger, 1893	+				
<i>Lycophidion uzungwense</i> (Loveridge, 1932)					+
<i>Duberria lutrix shirana</i> (Boulenger, 1894)		+			+
<i>Buroma procterae</i> (Loveridge, 1922)					+
<i>Crotaphopeltis tornieri</i> (Werner, 1897)			+		+
<i>Thelotornis kirtlandii</i> (Hallowell, 1844)					+
<i>Thelotornis mossambicanus</i> (Bocage, 1895)	+		+		
<i>Dipsadoboa werneri</i> (Boulenger, 1897)		+			
<i>Philothamnus macrops</i> (Boulenger, 1895)			+		
<i>Philothamnus hoplogaster</i> Günther, 1863*					
<i>Philothamnus semivariegatus</i> (Smith, 1847)*					
<i>Natriciteres variegata</i> (Peters, 1854)			+		
<i>Dasypteltis medici</i> (Bianconi, 1859)			+		
ATRACTASPIDIDAE					
<i>Atractaspis aterrima</i> Günther, 1863*					
VIPERIDAE					
<i>Causus defilippii</i> (Jan, 1862)*					
<i>Atheris ceratophorus</i> (Werner, 1895)		+			+
<i>Adenorhinos barbouri</i> (Loveridge, 1930)*					
<i>Bitis arietans</i> (Merrem, 1820)*					
<i>Bitis gabonica</i> (Duméril & Bibron, 1854)*					

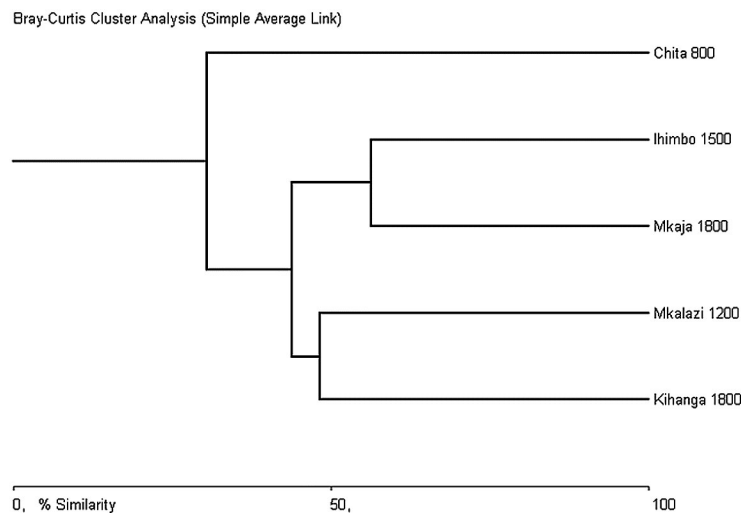


Figure 3. Similarity cluster among the five forest sites within the Udzungwa Scarp Forest Reserve.

seems to be the most discordant from the other sites, where relatively few endemics and more widespread and low altitude species are present. This indicates a marked species turnover between the lower part of the slopes and the submontane and montane layers, which are rich in specialised highland fauna. The firm trend of taxonomic turnover between the lowland and highland fauna of Tanzanian Mountains has been highlighted by Poynton (2003) and Loader et al. (2004). The remarkable similarity between sites 5 'Mkaja' and 2 'Ihimbo' might be related to the presence of extensive open wetlands and ecotone at both sites. In spite of the altitudinal differences (see Fig. 1), this indicates the presence of a specialised amphibian fauna, associated with open and ecotone habitat types. These habitats are completely absent or reduced in sites 4 'Kihanga' and 3 'Mkalazi', where a closed canopy forest is the main vegetation type.

Some of the strictly endemic species recorded for the Forest Reserve show a very restricted distribution area, often limited to a single site or valley (e.g., *Nectophrynoides wendyae*, *N. poyntoni*, *N. asperginis*, *Hyperolius kihangensis*, *Afrivalus* sp.), the complex distribution pattern and the exiguity of some species population deserve more research and conservation efforts. Large patches of undisturbed montane forests are still present in the Eastern Arc Mountains, while the lowland and sub-montane zones of the forest have suffered from extensive losses and fragmentation due to human disturbance (Newmark, 2002). In this context, the great size and altitudinal range of natural forest cover of this reserve, the extremely high level of strictly endemic and near endemic species, rank this reserve as one of the East-African sites with highest conservation priority.

ACKNOWLEDGEMENTS

Special thanks are due to many people who helped us in many ways. Kim H. Howell, David Moyer, John C. Poynton, Donald Broadley, Simon P. Loader, Charles Msuya, Colin McCarthy, Jens B. Rasmussen and Martin Pickersgill. Moreover Wilirk Ngalason, Francesco Rovero and Liana Trentin shared survey days with us. Finally we would like to thank the Tanzania Commission for Science and Technology (COSTECH) for providing permission to study Reptiles and Amphibians (permit NO 2002-039-ER-98-13); the CITES management authority in Tanzania and the Wildlife Division, who issued the necessary permits for the export of the specimens.

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