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Source: Journal of East African Natural History, 87(1) : 319-326

Published By: Nature Kenya/East African Natural History Society

URL: [https://doi.org/10.2982/0012-8317\(1998\)87\[319:HATTBO\]2.0.CO;2](https://doi.org/10.2982/0012-8317(1998)87[319:HATTBO]2.0.CO;2)

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HUMAN ACTIVITIES THREATENING THE BIODIVERSITY OF THE UZUNGWA SCARP FOREST RESERVE—TANZANIA

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ABSTRACT

Studies of human activities in the Uzungwa Scarp Forest Reserve, Udzungwa Mountains, were conducted in March–April and September 1997, in the western and southern parts of the forest. Different human activities, such as timber and pole cutting and withies harvesting, as well as the collection of non-timber forest products were recorded. Footpaths in the forest interior, past settlements and encroached areas were identified, as well as evidence of poaching. Due to the human activities, some timber species, for example *Ocotea usambarensis*, *Milicia excelsa* and *Azelia quanzensis* are almost exhausted. It was established that the main cause of the pressure in the reserve is the lack of alternative sources of forest products and other income generating activities. It is suggested that the people living around the reserve should be allowed traditional forest product uses under agreed regulations. Agroforestry involving planting of some desirable indigenous trees and the domestication of wild fruit tree species is also recommended. Other income generating activities should be encouraged. This is likely to reduce the pressure on the natural forest, thus contributing to biodiversity conservation.

INTRODUCTION

Uzungwa Scarp Forest Reserve covers about 19,384 ha and contains a high level of endemism and species diversity (Mmari & Mabula, 1996). Like other catchment forests in Tanzania, the Udzungwa Mountain forests are providing various functions beneficial to man. These are, for example, water conservation/watershed management (storage of water, regulating flow), control of soil erosion and gene pool conservation (Pócs, 1982; Nsolomo & Chamshama, 1988). Also people living in the surroundings of these mountains can obtain timber, poles, medicines and fuelwood from the forests.

However, the rich biological resources in the Udzungwa Mountains are threatened by various human activities (Mmari & Mabula, 1996). Some species could be extinct in the near future due to over-exploitation and habitat degradation. Forest laws and legislation of Forest Reserves in the Udzungwas seem to have been impractical. Forest managers lack proper knowledge to plan and implement better management plans, which take into consideration the utilisation of resources by local people.

The main objective of this study was to identify the human activities that are threatening the Uzungwa Scarp Forest Reserve's biodiversity, and other functions beneficial to humans.

The findings will partly form the basis for recommendations on the future management of this forest.

MATERIAL AND METHODS

Uzungwa Scarp Forest Reserve is located in the Udzungwa Mountains in southern central Tanzania between latitude 35°50' and 36°05' E and longitude 8°10' and 8°37' S (see figure 1 & 2 in Shangali *et al.*, this volume). The ethnic group of the people on the western side of the reserve is Wahehe. They practice subsistence farming.

Five vegetation types are represented in the Forest Reserve: (1) miombo woodland at Kihansi and at an altitude of 150–300 m a.s.l., (2) lowland rainforest represented along the Kihansi River at an altitude of 300–800 m, (3) submontane rain forest at 700–1,400 m, (4) montane rain forest at 1,400–1,800 m, occupying large areas in the reserve, (5) mountain bamboo forest in the northern part of the reserve, being the dominant vegetation type near Masisiwe and Mbawi villages (Shangali *et al.*, this volume).

A field survey was conducted in the western and southern part of the Uzungwa Scarp Forest Reserve to assess human activities in the forest. It was assumed that human activities are randomly distributed in the forest. In the representative villages transects were laid across the contours and/or along permanent footpaths from the forest boundaries to the forest interior. Eight transects were established, starting from the following villages: Ilutila, Idegenda, Masisiwe, and Mbawi in Iringa District and Ihimbo, Ukami, Uhafiwa and Kihansi in Mufindi District. Information on social and economic activities performed by the people living in the surroundings of the Reserve was obtained through interviews using unstructured questionnaires. Informal methods were also used to get information from the villagers and observations were made to cross-check information obtained during the interviews.

On each transect, signs of human activity were recorded. This included the number and location of trees felled. The trees were identified by local and botanical names and their uses were documented according to information given by the local ethnobotanists. The stumps were classified into three diameter categories: 0–5 cm (withies) 5–25 cm (poles) and >25 cm (timber). Any evidence of pitsawing, charcoal burning, fire encroachment or grazing was noted and tallied. Hunting and poaching were recorded and animal traps counted. Also, beekeeping and honey harvesting activities were recorded. This includes the presence of beehives and trees debarked for making beehives. Medicinal tree species were identified by their vernacular and botanical names, and the parts used as medicine, such as roots, leaves, bark or fruits were documented. Tree species used as food, including edible parts were noted. Paths encountered along the transects were also recorded. Forest gaps were counted and tallied and their sizes were estimated in hectares. All tree species on the transect and their uses were recorded as well as any other observations made or activities encountered.

FINDINGS

Despite the many laws and by-laws enforced by the custodians of the Uzungwa Scarp Forest Reserve, illicit use of forest products still takes place in the area. During the survey 367 incidences of human activities were observed. The main activities were tree felling (44 %), animal hunting (21 %) and trespassing (6 %) (table 1). Collection of fuel-wood, honey, mushroom, green stuffs, raw materials for rope making and handicrafts, such as *milulu* for

mats and bamboo for making of *tenga* baskets, were observed. Extraction of medicine and construction materials as poles, rafters and withies was also recorded. Hunting of wild animals, mainly wild pigs, hyraxes and moles was noted to be heavier in the northern part of the Reserve (Uluti, Mbawi, and Idegenda) than in the southern part (Kihansi, Ukami and Uhafiwa). This may be because forests in the north are closer to the villages, and boundaries are poorly defined.

Table 1. Different human activities encountered in the transects in different villages in the Uzungwa Scarp Forest Reserve.

Village	Uluti	Mbawi	Idegenda	Kihansi	Ukami	Uhafiwa	Ihimbo	Masisiwe	Total/%
Activity									
Tree-felling	51	52	45	8	4	3	0	0	163/44
Hunting	77	1	0	9	4	0	0	0	91/21
Trespassing	14	8	9	2	1	2	2	3	41/6
Gaps	13	3	3	5	2	0	0	0	26/7
Timber	10	0	0	0	0	0	0	0	10/3
Bee-keeping	0	6	0	0	0	0	0	0	6/2
Medicine	0	8	0	0	0	0	0	0	8/2
Fuelwood	6	0	4	0	0	0	0	0	10/3
Fire incidences	0	2	3	0	0	0	1	1	7/3
Mush-rooms	0	0	0	0	0	0	0	0	5/2
Totals	171/46	80/21	64/17	224/6	11/3	7/2	3/1	7/2	367/100

Altogether 163 incidences of felled trees were observed, of which 87 % were in Iringa District and only 13 % in Mufindi District in the southern part of the Reserve. Species preference is based on the quality of the wood, stem straightness, size, durability and suitability of the species for the desired use. Trees were felled for timber, poles, fuel-wood, mortars and the construction of canoes, and small trees were cut for withies.

Although no evidence of recent timber harvesting was observed, past timber harvesting was evident. In the northern part timber tree species that had been harvested include *Macaranga kilimandscharica*, *Albizia gummifera*, *Bridelia micrantha*, *Cassipourea malosana*, *Myrsine melanophloeos*, *Chrysophyllum gorungosanum* and *Ocotea usambarensis*. The quality timber species, *O. usambarensis*, was reported to have been abundant in the past, but is now almost exhausted. In the southern part, in Ukami and Kihansi, tree species that were reported to have been harvested include *Milicia excelsa*, *Khaya anthotheca*, *Pterocarpus angolensis*, *P. milbraedii* and *Azelia quanzensis*. Others include *Newtonia buchananii* and *Brachystegia speciformis*. Although there are other potential timber species in the south they have not been harvested. This may be because the timber merchants only buy certain preferred species.

Tree species used for poles in buildings in the northern part of the reserve include *Bridelia micrantha*, *Myrica humilis* and *Cythea manniana* (tree fern). These species are preferred due to their resistance to rot and attack by termites. In the south many trees are used as poles, including *Bridelia micrantha*, *Uapaca* spp, *Brachystegia spiciformis*, *Englerophyton natalensis*, *Vepris nobilis* and *Sorindea madagascariensis*. Although in the southern part there are many species suitable for poles, very few trees had been cut for that purpose. This may be because of the distance from the village to the forest and/or due to the availability of suitable species near their households.

Withies are used in the construction of houses. The most preferred withies species include *Arudinaria alpina* (mountain bamboo), *Stryconos* sp., *Vepris nobilis*, *Uvariadendron* spp,

Oxyanthus speciosus and *Turraea holstii*. No evidence of trees cut for use as withies was noted in the south, but it was evident in the northern side.

Making tool-handles is another use for trees identified in the area. Small trees or branches of trees are preferred for the purpose. Handles may be for hoes, local weapons called *nyengos*, spears, or axes. Tree species used for the handles for hoes and *nyengos* include *Albizia gummifera*, *Xymolos monospora*, *Ochna holstii* and *Markhamia obtusifolia*. Spear handles are made of *Englerophyton natalensis* and *Vepris* spp. Mortars and pestles are very important utensils in every household in the area. They are used for pounding various foodstuffs. Mortars were reported to be made from tree species like *Albizia gummifera*, *A. glaberrima* and *Syzygium guineense*. The species used for making pestles were *Olinia* spp, *Englerophyton natalensis* and *Milicia excelsa*, as well as *Ochna holstii*, *Combretum* spp, *Dalbergia* spp and *Prunus africana*.

Evidence of pitsawing is indicated by the presence of pits used for sawing timber, and leftovers of slabs indicate the species that have been sawn. In the whole study area, only ten cases of past pitsawing were observed and these were equally distributed between the northern and southern parts. Although we did not find any evidence of recent pitsawing, the District Natural Resources Officer reported to have seized over 2,000 pieces of timber that had been bought from local pit-sawyers. This indicates that there is still illicit pitsawing in the area.

Two sites were identified as past settlements, one was at Ukami and the other at Kihansi, where cultivation mounds are even found within the forest. These were indicated as open gaps covered by pioneer tree species, herbaceous plants and grasses. Leftovers of cultivated food plants such as *Mangifera indica*, *Carica papaya*, *Piper* spp, and medicinal plants such as *Ricinus communis* were still conspicuous. Some other areas where gaps exist were reported as past encroached areas. At the Kihansi dam site there is an extensive area which had previously been cultivated but is now vacated and it was not easy to establish whether it was within the Forest Reserve or not. The size of the gaps ranged from 0.5 ha to 2.0 ha. Other gaps were reported to have been caused by elephants, which were present in the past, but the gaps could not be distinguished by their origin. It was also difficult to trace the exact boundary between the Forest Reserve and the public land. Encroachment had resulted from population growth and decrease in soil fertility in the croplands, which had created pressure on more fertile lands in the forest.

Seventy-eight animal traps ranging from snares to pits were observed in the forest near Ilutula-Uluti villages. Animals hunted include pigs, moles and hyraxes. In the south no evidence of hunting was noted. Villagers reported that they obtained meat from the lowlands where wild animals are plentiful. Hunting of animals has been taking place in the forest for a long time. Tree hyrax (*Dendrohyrax* spp), duikers (*Cephalophus* spp), colobus monkeys (*Colobus* spp) and bush pigs (*Potamochoerus larvatus*) were reported to have been plentiful in the past. It is known that local people hunt for meat the sanje mangabey (*Cercocebus sanje*), which is an endemic primate species in the Udzungwas (Dinesen, 1997). Because hunting has been going on for a long time monkeys are absent in some areas, and other animals are rare.

Beekeeping activities in the forest include the construction of beehives and hanging of traditional hives on trees. Trees are debarked and the bark is used to construct hives, or hives are constructed from tree boles. The tree species used for beekeeping include: *Macaranga kilimandscharica*, *Bridelia micrantha*, *Vitex doniana* and *Albizia gummifera*. Honey harvesting was noted at Mbawi, where an open fire had been used to disperse the bees. This

method is considered to be one of the main causes of forest fires, which cause the depletion of biodiversity in the Udzungwa forests (Sabuni, 1997).

Thirty-two footpaths were recorded in the area. Footpaths are used as shortcuts to neighbouring villages and farms and to the lowland where the local people sell their products. Trespassing sometimes results in unplanned activities, such as tree debarking and creating resting areas, where forest fires may start.

The construction of the Kihansi hydroelectric power station is currently going on in the area. This construction is accompanied by construction of a dam, residential and office buildings and a road from the dam site to the valley where the offices are located (for more information of the environmental impact see TANESCO, 1995).

Various other uses of the forest trees were identified in the area, including building materials, fuel-wood, medicinal uses and use of weaving material, honey production and fodder (table 2; see also Shangali *et al.*, this volume).

Table 2. Different tree uses by local people in the Uzungwa Scarp Forest Reserve

Tree uses	Total (%)
Building materials	110 (29)
Fuelwood	102 (26)
Medicinal	46 (12)
Timber	41 (11)
Utensils	31 (8)
Edible products	18 (5)
Honey production	11 (3)
Fishing	4 (1)
Weaving	3 (1)
Fodder	3 (1)
Other uses	9 (2)

The people living in the western side of the Uzungwa Scarp Forest Reserve mainly belong to the Hehe ethnic group. They depend on subsistence farming and limited animal husbandry. A traditional, so-called '*bum*' cultivation method is practised on the poor soils. Monoculture farms are located on open hilltops and steep slopes without well-defined soil conservation measures against erosion. This farming system accelerates soil degradation, and the heavy rains in the area result in poor soil fertility and hence low yields. Main crops cultivated are maize, finger-millet, Irish and sweet potatoes. According to Mariki & Chingege (1996) maize production is about 0.45 t/ha compared to 4 t/ha in some other areas in the country where modern farming is practised. Thus household production is mainly food crops for personal consumption and only a limited excess is produced to be sold or converted to secondary products such as local brew made from maize and millet. Savings from agricultural production are quite low and do not provide for much improvement in the living standard.

Animal husbandry is limited to pigs, sheep, chicken and goats (table 3). From the study it seems that the forest is the main source of animal protein. This is reflected in the high number of traps in the forest near the villages. One possible reason for lack of cattle in the area is a lack of capital to buy them. Most of the goats are obtained using loans from the HIMA Project, which is trying to supply goats for milk and meat for local people.

The density of tree species varies according to the species and the use of the species. Timber tree species like *Ocotea usambarensis*, *Milicia excelsa* and *Azizia quanzensis* are

almost exhausted, while others like *Bridelia micrantha*, *Myrianthus arboreus*, *Syzygium guineense* and *Chrysophyllum gorungosanum* have less than 50 stems per hectare (table 4).

Table 3. Number of livestock and population in Idete ward in late 1996 (Mariki & Chimgege, 1996).

Village	Population	Chicken	Goats	Sheep	Pigs
Idete	1362	1160	50	0	58
Ilutila	1645	1600	15	0	180
Uluti	600	800	18	3	20

Table 4. Density of different tree species/genra per hectare in the Uzungwa Scarp Forest Reserve.

TREE SPECIES	Stems/ha
<i>Albizia gummifera</i>	100
<i>Anthocleista grandiflora</i>	25
<i>Aphloia theiformis</i>	275
<i>Bersama abyssinica</i>	65
<i>Bridelia micrantha</i>	50
<i>Caesaria battiscombei</i>	25
<i>Chrysophyllum gorungosanum</i>	25
<i>Ficus</i> spp.	25
<i>Garcinia huillensis</i>	25
<i>Grewia</i> sp.	25
<i>Halleria lucida</i>	50
<i>Macaranga kilimandscharica</i>	65
<i>Mimosopsis</i> spp.	38
<i>Ochna holstii</i>	125
<i>Parinari excelsa</i>	75
<i>Phoenix reclinata</i>	75
<i>Polyscias fulva</i>	25
<i>Psychotria</i> spp.	150
<i>Syzygium guineense</i>	25
<i>Tabernaemontana pachysiphon</i>	50
<i>Vernonia</i> spp	175
<i>Vitex doniana</i>	50
<i>Xymalos monospora</i>	25
<i>Zanthoxylum</i> spp	250

CONCLUSIONS

On the basis of this study it is evident that measures to prevent local people from the use of forest products seriously affects their daily life. This is because the people do not have any alternatives to forest use. The people's main source of income is from agriculture, which constitutes over 90 % of the total household income (Mariki & Chimgege, 1996). There is no permanent cash crop in the area. Because of the indigenous farming techniques production is lower than in other parts of the country, where modern methods have been adopted; as a result the people view the forest as an alternative source of income. On the other hand, the increasing cost of medical services makes the people rely more on traditional medicine to treat their ailments. Similarly, they don't have alternative sources to replace the forest

products. Although natural forest tracts exist in the villages they are not big enough to meet the people's needs.

RECOMMENDATIONS

It is suggested that people living around the Forest Reserve should be allowed, under agreed regulations to continue some traditional forest product uses. Also, strictly reserved areas as well as hunting free zones should be established in the Reserve. Agroforestry is recommended, along with the planting of some desirable indigenous tree species such as *Bridelia micrantha*, *Macaranga kilimandscharica*, *Syzygium guineense* and *Albizia gummifera*. Domestication of wild fruit trees, such as *Vangueria infausta*, *Uapaca kirkiana* and *U. nitida*, should also be considered. Other income generating activities such as animal husbandry and small-scale industries should be encouraged as well. This would reduce peoples dependency on forest products as a source of income and thus reduce the pressure on the natural forest.

ACKNOWLEDGEMENTS

We are very grateful to the Finnish Support to Forest Research in Tanzania (FORST) project for financing this study. Special thanks go to Dr Matti Nummelin for the various efforts he made for the study to be accomplished and Mirja Ruokonen for her comments on the manuscript. We would also like to thank all who assisted us in one way or another for the success of the study.

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