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Full Length Research Paper

Herpetofauna under threat: A study of Kogyae Strict Nature Reserve, Ghana

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The herpetofaunal species in Ghana are under serious threat from habitat loss and degradation, global climate change, disease and parasitism, introduced invasive species and unsustainable use. The herpetofaunal species of the Kogyae Strict Nature Reserve of Ghana were surveyed using two methods: refuge examination via direct searches, visual/audio surveys and interviews of local residents. Data were obtained during two visits to two study sites in 2012: savanna woodland and riparian forest mosaic. The first visit was in the dry season in January, 2012 for five days and the second visit in the rainy season in June, 2012 for six days. Thirty-six herpetofaunal species were recorded, comprising of 14 amphibians and 22 reptiles. Ten of the reptiles were recorded only from interviews. The savanna woodland recorded a higher number of species (33) than the riparian forest mosaic (22), and there was low similarity in species between the two sites (Sorenson's similarity index, $C_s = 0.42$). Four species were frequently encountered at both sites in high numbers: *Phrynobatrachus natalensis*, *Phrynobatrachus latifrons*, *Arthroleptis* spp. and *Trachylepis affinis*. Two lizard (*Varanus niloticus* and *Varanus exanthematicus*) and two snake (*Python sebae* and *Python regius*) species are of both local and global conservation significance. The lizards are categorized under Schedule I (complete protection) and the pythons under Schedule II (partial protection) of the Ghana Wildlife Conservation Regulations. The main threats to the herpetofaunal species of the study area include habitat destruction due to annual bushfires and killing of large reptiles like the monitors as well as snakes. It is recommended that riparian vegetation bordering streams should be particularly targeted to conserve herpetofauna of the study area.

Key words: Africa, biodiversity, Ghana, herpetofauna, Kogyae, protected area, reserve.

INTRODUCTION

Herpetofauna (amphibians and reptiles) are a diverse but cryptic component of an ecosystem, and can thus serve as excellent bio-indicators of stressed ecosystems

(Leduc, 2012). Amphibians are especially sensitive to ecosystem changes because of their biphasic lifestyle which brings them in direct and constant contact with

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their environment and exchange of gases through their moist, semi-permeable skin, which plays a role in chemical uptake. While reptiles are better protected against the environment with their integument covered with scales, their eggs are still susceptible to metal contaminants (Leduc, 2012) like those of amphibians. Both amphibians and reptiles are ectothermic and rely on environmental conditions to maintain metabolism and other life processes, and also are susceptible to acidification and metal contaminants (Leduc, 2012).

Conservation strategies are often targeted at glamorous taxa such as birds and mammals, neglecting smaller and less conspicuous vertebrates like herpetofauna, which are threatened and are declining more rapidly than birds and mammals (Ramesh, 2013). The main causes of herpetofaunal population declines include habitat loss and degradation, global climate change, disease and parasitism, introduced invasive species and unsustainable use (Gibbons et al., 2000; Stuart et al., 2004).

Wildlife protected areas (PAs) are of economic importance as they contribute to improvement of surrounding communities' living standards. Livelihood support programmes and community-based tourism programmes exist in some communities surrounding some protected areas (IUCN/PACO, 2010), which are of cultural, aesthetic, and spiritual significance, in addition to being sources of wood and medicinal products. In Ghana, PAs are under threat from poaching, bushfires and land conversion due to farming and grazing (IUCN, 2010). There are 23 wildlife PAs in Ghana with a total area of 1,347,600 ha or 5.6% of the country's total land area (IUCN, 2010). These include seven national parks, six resource reserves, two wildlife sanctuaries, one strict nature reserve, one biosphere reserve and six Ramsar sites.

The Kogyae Strict Nature Reserve is the only Strict Nature Reserve in Ghana. Strict Nature Reserve is defined by the International Union for Conservation of Nature (IUCN) as Category Ia: A protected area managed mainly for scientific research and monitoring; an area of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species (IUCN, 1994).

Information on herpetofaunal species diversity in Ghana's protected areas is scanty and not regularly updated. Inventories of species in reserves are important for conservation, monitoring and management as well as the acquisition of baseline data on the distribution and status of even common species (Trakimas, 1999). The forests around Ejura in the Ashanti region have been totally destroyed by human settlements. Located in the area, Kogyae, the only Strict Nature Reserve in Ghana protects an important fragment of riparian forest left on the Afram Plains. This survey was therefore conducted to update existing knowledge regarding herpetofaunal abundance, distribution and diversity in the Kogyae Strict

Nature Reserve; provide a preliminary herpetofaunal species list for the reserve; determine existing threats to herpetofauna in the reserve.

MATERIALS AND METHODS

Study area

The Kogyae Strict Nature Reserve (KSNR) (07°12'N 01°11'W) (Figure 1), with an area of 388 km², is located in the forest-savanna transition zone. It is bordered by the Afram river and riparian forest along its south-western boundary. There is also transition woodland, a small pocket of dry forest and small rocky hills in the west (Dowsett-Lemaire and Dowsett, 2005). Much of the reserve has lost its status of a "strict nature reserve", due to logging and hunting activities as well as an increasing number of farms encroaching from the south and east (Kyerematen et al., 2014). There are forest remnants, part of the original Kujani forest (Sam and Wilson, 1994) belonging to a dry type of semi-evergreen or deciduous forest with small pockets of *Anogeissus leiocarpus*, *Ceiba pentandra*, *Cola gigantea*, *Khaya senegalensis*, *Milicia excels* and *Triplochiton scleroxylon*.

The reserve protects five species of monkeys, including *Cercopithecus mona* (mona monkey) and *Papio anubis* (baboon). Other mammals include buffaloes (*Syncerus caffer*), civets (*Civettictis civetta*), galagos (*Galago senegalensis*, *Galagoides demidoff*) and squirrels (*Protoxerus stangeri*). There are also 85 species of birds, including francolins and hornbills. Sampling was undertaken in two distinct habitats types, riparian forest mosaic (RFM) at Oku Nkwanta and savanna woodland (SW) with some rocky outcrops at Dagomba village towards Asasebonso (Figure 1).

Methodology

Visual encounter surveys (Rödel and Ernst, 2004) and refuge examination were undertaken either opportunistically or with acoustic searching, by turning over rocks and fallen logs, peeling tree barks, digging through leaf litter, and searching through trees and buildings, rotten tree stumps, tree buttresses, termite mounds and burrows. Care was taken to ensure minimal disturbance of habitats during refuge examination by returning objects moved to their original positions after searching them. A three-man search team positioned themselves five metres apart from each other to search for herpetofaunal species during the day. On sighting a lizard or a snake, a member signaled to the others to converge at a point to surround and capture the specimen. A running animal was chased and pinned down gently with a stick or a snake hook, then hand-picked. Amphibians were surveyed in and around ponds and puddles at the study sites (Heyer et al., 1994).

Interviews were conducted with a cross-section of inhabitants to supplement information obtained from the other methods. The interviews focused on the different types of species commonly found in the study area and some indication of their abundance (commonness and rarity). A manual was shown to the respondents to help them identify the various animals known to occur in the area and to answer questions about those animals. Questions asked included whether the respondent knew a particular animal, and whether he/she had seen that animal before, how often and when the animal was seen. Respondents were not considered "experts" in herpetology, but since most of the inhabitants of the study area were farmers, they were expected to have encountered some herpetofaunal species during their farming activities. The few hunters among them seemed to have more information about wild animals in general.

Animals were recorded based on sightings, captures,

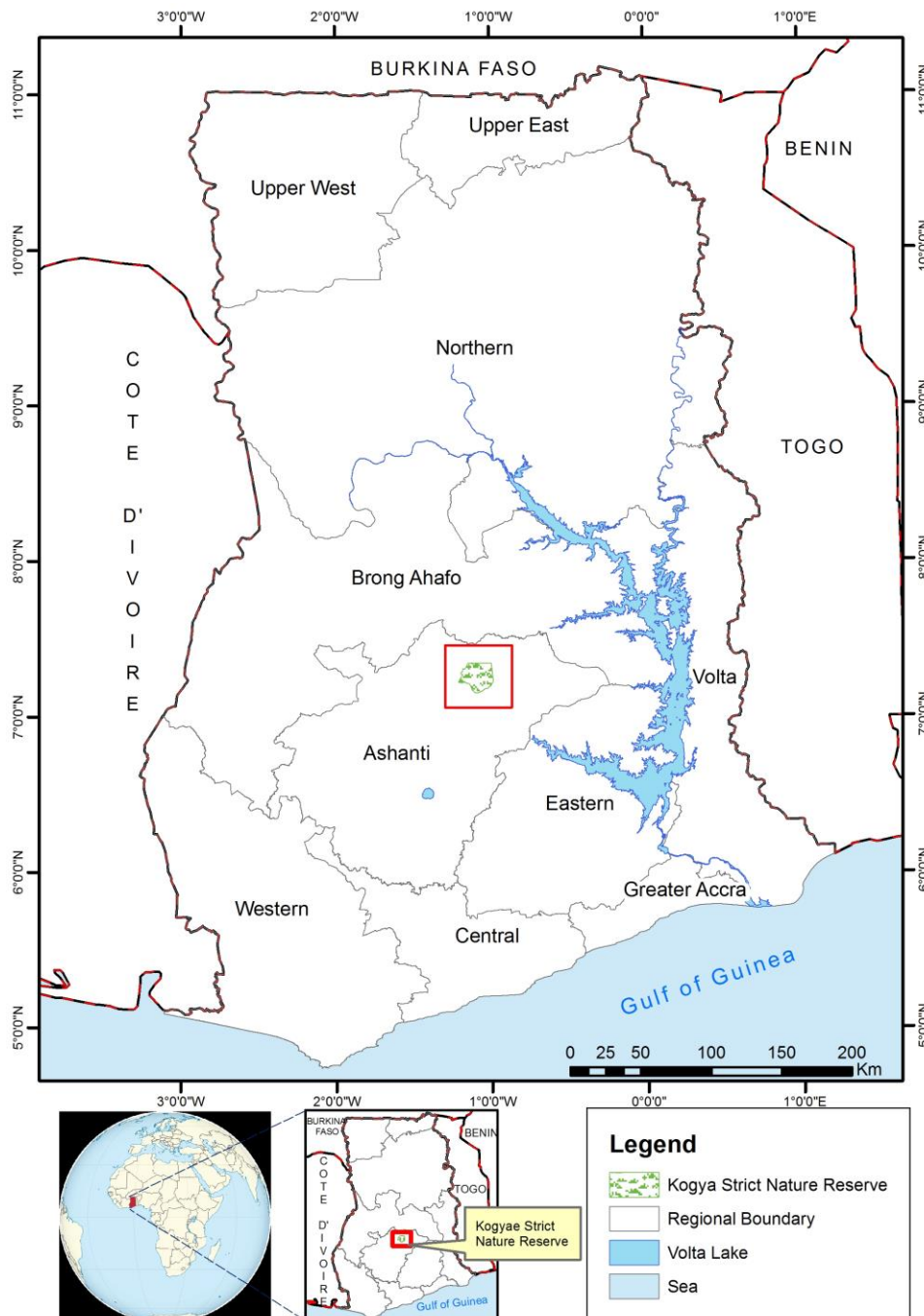


Figure 1. Study Area: Kogyae Strict Nature Reserve.

calls/sounds and interviews. Such records were considered to be “encounters”. There was the possibility of multiple counts since animals were not marked, but to minimize multiple counts, no one particular section of a study site was repeatedly surveyed within each survey period. Amphibian calls were recorded at various water bodies (ponds, pools, puddles, and streams) in the study sites. At each water body, the recorder listened carefully to a chorus and was able to distinguish calls of individual species that were clearly heard. Calls were also recorded and played back later for confirmation. In a chorus, only species presence can be recorded

as it is difficult to attach numbers. However, at each water body, individuals begin calling and are later joined by others to form a chorus. Hence, the position of those that begin the calls can be pinpointed, usually along the edges of the water body. Those calling whose positions were clearly identified were recorded.

Voucher specimens were euthanized with chloroform, fixed in 10% formalin and preserved in 70% alcohol. General herpetofaunal identification followed Hughes (1988) and Leache et al. (2006), while amphibian species were identified using Rodel (2000), Rodel and Agyei (2003), Rodel et al. (2005) and Onadeka and Rodel

(2009). Skink identification was based on Hoogmoed (1974), while Chippaux (1999) and Trape and Mane (2006) were used for snake identification.

The survey sites were visited twice, once in the dry season (5 to 9th January, 2012) and once in the rainy season (16 to 21st June, 2012). There were 11 survey days in total, five days in the dry season and six days in the rainy season.

Species encounters were plotted on an accumulation curve. In Ghana, the dry season falls between October and March, while the rainy season occurs between April and September. The possibility of multiple counts and the fact that the survey was mainly semi-quantitative and qualitative, did not allow for rigorous statistical analysis thus only involved a species accumulation curve and Sorenson's qualitative index. Sorenson's similarity index (C_S) was used to determine the extent of similarity between the sites (Magurran, 2004) as follows:

$$C_S = \frac{2c}{a+b+2c} \quad (1)$$

Where,

a = number of species at first site,

b = number of species at second site

c = number of species common to both two sites.

RESULTS

Herpetofaunal abundance and diversity

There were direct encounters of 26 herpetofaunal species comprising of 14 amphibian (two toads and 14 frog) species and 12 reptile (six lizard and six snake) species belonging to 12 families. Seven amphibian families were recorded, notably the Bufonidae, Ranidae, Dicroglossidae, Ptychadenidae, Hyperoliidae, Arthroleptidae and Petropedetidae. There were also three lizard (Agamidae, Scincidae and Gekkonidae) and two snake families (Colubridae and Elapidae) recorded (Table 1). Ten more reptile species were recorded only through interviews of local residents, bringing the total recorded herpetofaunal species at KSNR to 36. This was made up of 22 reptile (eight lizards and 14 snakes) and 14 amphibian species belonging to 15 families (Table 2). Members of the family Varanidae as well as two snake families, Pythonidae and Viperidae were not directly encountered.

The interviews indicated that monitor lizards; *Varanus exanthematicus* and *Varanus niloticus* were regularly encountered, mostly on weekly basis. *Bitis gabonica*, the largest viper in Ghana, was rarely sighted. The last time one encountered was about five years prior to this survey when it bit a woman who died the same day. The viper was promptly killed by the people and eaten. About two or three individuals of *Python sebae* were sighted yearly, and these were killed and eaten. *Python regius* were rarely sighted, with no respondent able to recollect accurately the last time they sighted a *Python regius*.

There were higher numbers of amphibians encountered than reptiles, with 60 individual encounters each of *Phrynobatrachus natalensis*, *Phrynobatrachus latifrons* (both through calls) and *Arthroleptis* sp. This was

followed by *Hoplobatrachus occipitalis* (22 encounters), *Phrynobatrachus francisci* (20 encounters), and *Afraxalus dorsalis* (11 encounters). Five amphibian species were encountered only once: *Amnirana galamensis*, *Ptychadena bibroni*, *P. longirostris*, *Leptopelis viridis* and *Hyperolius concolor*. Among the reptiles, *Trachylepis affinis* and *Agama agama* were the most encountered, with 58 and 20 individuals respectively. Five reptile species were encountered once, notably the lizards *Trachylepis maculilabris* and *Panaspis togoensis* and the snakes *Thelothornis kirtlandii*, *Lamprophis lineatus* and *Naja nigricollis*. Seven more species, all amphibians, were encountered in the savanna woodland (22 species) than in the riparian forest mosaic (15 species) with 11 species common to both sites (Table 1). Eleven species were thus exclusively encountered in savanna woodland, while four species were exclusively encountered in the RFM (Table 1).

Species accumulation curve

The species accumulation curve rose sharply for the first two days, and continued to rise gently to the end of the dry season survey on the fifth day. The curve continued to rise in the rainy season survey and then flattened completely at the end of the rainy season survey (Figure 2).

Similarity

Overall, Sorenson's similarity index was 0.42, indicating low similarity between the two sites. There were 21 species common to both sites, with 13 species exclusive to the SW and two species exclusive to RFM (Table 2). In the dry season, 12 herpetofaunal species were recorded in SW (seven amphibian and five reptile species) while 10 were recorded in RFM (three amphibian and seven reptile species) with six species common to both sites. In the rainy season, 13 species were recorded in SW (seven amphibian and six reptile species) while nine species (three amphibian and six reptile species) were recorded in RFM with six species common to both sites (Table 1).

In the SW, the number of amphibian species (seven) was the same for the two seasons but one more reptile species (six) was recorded in the rainy than the dry season (five). Only three species, one frog (*Hoplobatrachus occipitalis*) and two lizards (*A. agama* and *T. affinis*) were common to the two seasons. In the RFM, the number of amphibians was the same for both seasons, but there was one less reptile in the dry season than in the rainy season. Four species (two lizards - *Trachylepis quinquetaniata* and *T. affinis* and two snakes - *Psammophis sibilans* and *Paranerita irregularis irregularis*) were common to the seasons (Table 1). *T. affinis* was the only species recorded in all the surveys.

Table 1. Herpetofaunal distribution and diversity at Kogayee Strict Nature Reserve (Direct encounters included sightings, captures and calls; TE = Total Encounters).

Species	Common names	Savanna Woodland			Riparian forest mosaic		
		Dry	Rainy	TE	Dry	Rainy	TE
Amphibia: Anura	Frogs and Toads						
Bufo							
<i>Amietophrynus maculatus</i>	Flat-backed toad	-	2	2	-	-	-
<i>Amietophrynus regularis</i>	Square-marked toad	-	2	2	-	-	-
Rana							
<i>A. galamensis</i>	Golden-backed frog	-	1	1	-	-	-
Dicroglossidae							
<i>Hoplobatrachus occipitalis</i>	Crowned bullfrog	7	15	22	-	-	-
Ptychadenidae							
<i>Ptychadena longirostris</i>	Snouted grass frog	1	-	1	-	-	-
<i>Ptychadena bibroni</i>	Broad-banded Grass frog	1	-	1	-	-	-
<i>Ptychadena</i> sp.	Grass frog	3	-	3	-	-	-
Petropedetidae							
<i>Phrynobatrachus natalensis</i>	Natal puddle frog	30	-	30	30	-	30
<i>Phrynobatrachus latifrons</i>	Ahl's river frog	-	25	25	-	35	35
<i>Phrynobatrachus francisci</i>	Francis river frog	-	15	15	-	5	5
Hyperoliidae							
<i>Hyperolius concolor</i>	Variable reed frog	-	-	-	1	--	1
<i>Afrivalus dorsalis</i>	Cameroon leaf-folding frog	-	5	5	-	6	6
Arthroleptidae							
<i>Leptopelis viridis</i>	Rusty tree frog	1	-	1	-	-	-
<i>Arthroleptis</i> sp.	Screeching frog	30	-	30	30	-	30
Reptilia: Squamata: Lacertilia							
Agamidae							
<i>A. agama</i>	Rainbow lizard	7	9	16	-	4	4
Scincidae							
<i>T. quinquetaniata</i>	Five-lined mabuya	1	-	1	1	2	3
<i>T. affinis</i>	Senegal mabuya	8	9	17	31	10	41
<i>T. maculilabris</i>	Speckle-lipped mabuya	-	-	-	1	-	1
<i>Panaspis togoensis</i>	Togo skink	-	1	1	-	-	-
Gekkonidae							
<i>Hemidactylus muriceus</i>	Guinea leaf-toed gecko	1	-	1	1	-	1
Reptilia: Squamata: Serpentes							
Colubridae							
<i>Psammophis sibilans</i>	Hissing sand snake	1	-	1	1	1	2
<i>Psammophis phillipsi</i>	Olive sand snake	-	1	1	-	2	2
<i>Thelotornis kirtlandii</i>	Twig snake	-	1	1	-	-	-
<i>Lamprophis lineatus</i>	Striped house snake	-	1	1	-	-	-
<i>Philothamnus irregularis</i>	Green tree snake	-	-	-	1	1	2
Elapidae							
<i>Naja nigricollis</i>	Spitting cobra	-	-	-	1	-	1
Total individuals		91	87	178	98	66	164
Total species		12	13	22	10	9	15

Table 2. Species list and conservation status of herpetofauna at the Kogyae Strict Nature Reserve.

Species	Survey sites		Capture method	Conservation status		
	SW	RFM		IUCN	CITES	NPS
Amphibia						
<i>Amietophrynus maculatus</i>	*		DC, S	LC	-	-
<i>A. regularis</i>	*		DC, S	LC	-	-
<i>Amnirana galamensis</i>	*		DC	LC	-	-
<i>Hoplobatrachus occipitalis</i>	*		DC, S, C	LC	-	-
<i>Ptychadena bibroni</i>	*		DC	LC	-	-
<i>P. longirostris</i>	*		DC	LC	-	-
<i>Ptychadena</i> sp.			DC, S	LC	-	-
<i>Hyperolius concolor</i>		*	DC	LC	-	-
<i>Afraxalus dorsalis</i>	*	*	C	LC	-	-
<i>Leptopelis viridis</i>	*		DC	LC	-	-
<i>Arthroleptis</i> sp.	*	*	DC, S	LC	-	-
<i>Phrynobatrachus natalensis</i>	*	*	C	LC	-	-
<i>P. francisci</i>	*	*	C	LC	-	-
<i>P. latifrons</i>	*	*	C	LC	-	-
Reptilia						
<i>A. agama</i>	*	*	DC, S	LC	-	-
<i>Hemidactylus muriceus</i>	*	*	DC	LC	-	-
<i>Trachylepis maculilabris</i>		*	DC, S	LC	-	-
<i>T. affinis</i>	*	*	DC, S	LC	-	-
<i>T. quinquetaniata</i>	*	*	DC, S	LC	-	-
<i>Panaspis togoensis</i>	*		DC, S	LC	-	-
<i>Varanus exanthematicus</i>	*		I	NE	II	I
<i>V. niloticus</i>	*	*	I	NE	II	I
<i>Python sebae</i>	*	*	I	LC	II	II
<i>P. regius</i>	*	*	I	LC	II	II
<i>Thelotornis kirtlandii</i>	*		S	LC	-	V
<i>Philothamnus irregularis</i>	*	*	DC, S	LC	-	-
<i>Dispholidus typus</i>	*	*	I	LC	-	V
<i>Psammophis sibilans</i>	*	*	S	LC	-	-
<i>P. phillipsi</i>	*	*	S	LC	-	-
<i>Lamprophis lineatus</i>	*		DC	LC	-	-
<i>Dendroaspis viridis</i>	*	*	I	LC	-	V
<i>Naja nigricollis</i>	*	*	I	LC	-	V
<i>N. melanoleuca</i>	*	*	I	LC	-	V
<i>Causus maculatus</i>	*	*	I	LC	-	V
<i>Echis ocellatus</i>	*		I	LC	-	V
<i>Bitis gabonica</i>	*	*	I	LC	-	V
Number of species	33	23	-	-	-	-

* = Species present study sites: SW = Savanna Woodland; RFM = Riparian Forest Mosaic; Capture Method: DC = Direct capture (Handled); I = Interview, S = Sighted; C = Calls Heard; Conservation Status: IUCN: LC = Least Concern; NE = Not Evaluated; CITES: Appendix II = Limited Trading; NPS (National Protection Status): I = First Schedule (Full Protection); II = Second Schedule (Partial Protection); V = Fifth Schedule (Measures Taken to Reduce Numbers).

DISCUSSION

Hughes (1988) listed 71 amphibian species for Ghana, and an amphibian survey of some protected areas in

southern Ghana (Hillers et al., 2009) revealed the following species richness: Kalakpa National Park (7), Owabi Wildlife Sanctuary (12), Tano-Offin Forest Reserve (13), Bia National Park (14) and Ankasa

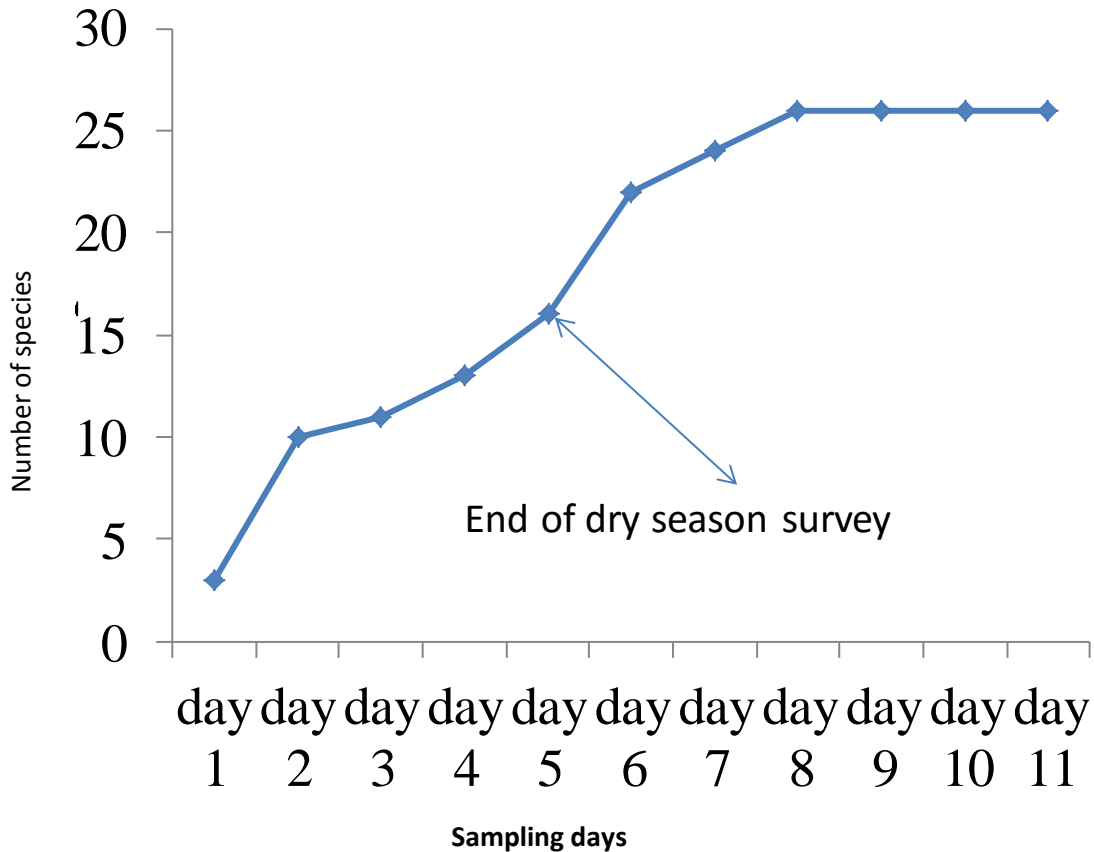


Figure 2. Species accumulation curve: Cumulative number of Herpetofaunal species sampled at Kogyae Strict Nature Reserve.

National Park (28). A recent survey of two fragmented forest reserves in a moist semi-deciduous forest of the Amansie West District of the Ashanti Region of Ghana revealed 40 herpetofaunal species of which 16 species were amphibians (Yahaya et al., 2013). Some forest surveys in Ghana revealed between 10 and 20 amphibian species per site (Rodel et al., 2005). A more extensive survey in the Kyabobo National Park in Ghana recorded 65 herpetofaunal species comprising of 26 amphibians and 39 reptiles (Leache et al., 2006).

The 36 herpetofaunal species listed in this survey represents about 42% of the 86 known herpetofaunal species listed for the Guinea savanna vegetation zone of Ghana (Hughes, 1988). The 14 amphibian species recorded in this survey falls within the range normally recorded for amphibian surveys in Ghana. The flattening of the species accumulation curve in this Kogyae survey suggested that the commonest species in the area had been recorded.

According to Omogbai et al. (2002) a population explosion of amphibians occurs during the rainy season, and this consequently influences the populations of snakes. This was not the case in this survey, as there was no observable difference in the number of

amphibians recorded in both dry and the rainy seasons. Also, the annual bushfires in the dry season did not appear to have influenced the species numbers, with the number of species remaining similar for both dry and rainy seasons.

Six species, comprising of three skinks (*Hemidactylus muriceus*, *T. maculilabris* and *P. togoensis*) and three snakes (*B. gabonica*, *Desmarestia viridis* and *Thelotornis kirtlandii*), are known forest inhabitants (Hughes and Barry 1969; Hughes 1988). The remnant of the dry semi-deciduous forest in the Kogyae Strict Nature Reserve could therefore support sustainable populations of existing forest herpetofauna if well-protected.

Conservation issues

Most of the herpetofauna recorded in this survey are listed as 'Least Concern' in the IUCN Red List of Threatened Species. However, in the Ghana Wildlife Conservation Regulations (1971), *Varanus niloticus* and *V. exanthematicus* are listed in the first schedule (complete protection), while both *Python sebae* and *P. regius* in the Second Schedule (partial protection) and all

venomous snakes are listed in the fifth schedule (can be killed when their population expands to make them dangerous to humans and/or their livestock). The dry season survey (January 2012) recorded large-scale bushfires in both SW and RFM, but this did not appear to affect the species composition as shown in Table 1.

The main threats to the herpetofaunal populations in the study area are largely anthropogenic, notably the annual bushfires and indiscriminate killing of species like monitors and pythons. The bushfires not only kill the herpetofaunal species, but also destroys their habitats. The monitors and snakes are killed largely for food, while snakes in general are killed because of irrational fears arising out of human superstition. This situation has negative consequences for ecosystem balance (Attuquayefio, 2004). Poverty and lack of formal education are widespread in most parts of rural Ghana. Initiation of education and poverty alleviation programmes will thus go a long way to improve interaction between humans and wildlife in such areas. This study incorporated an outreach component, where the researchers organized a durbar to meet the communities within the study area and sensitize them on the nature and importance of such researches. At such durbars, the communities were educated on the importance of wildlife and the need to protect them.

The estimated 2,000 to 3,000 sacred grooves in Ghana serve important ecological and socio-cultural functions by preserving virgin forests as well as being important refuges for rare and important local biodiversity and a source of herbs for medicinal, social and religious purposes. Sacred grooves are defined as "small patches or islands of remaining original habitat" or "traditionally-protected tracts of land of varying sizes that may be as old as mankind" (Attuquayefio and Fobil, 2005). They range in size from hundreds of hectares of forest to single trees or a few stones as ancestral groves, shrines, ancestral forests and burial grounds of different ethnic groups in Ghana (Ntiama-Badu, 1995). Sacred grooves are considered to be one form of traditional conservation practice in Ghana. Traditional conservation is also practiced in Ghana in the form of taboos (traditional laws) and myths. In some urban and most rural areas in Ghana, taboo days exist for farming, fishing and hunting. Spiritual reasons are given as to why people could not farm, fish or hunt on certain days. Such traditional practices enabled the protection of biological resources from human disturbance and over-exploitation (Attuquayefio and Fobil, 2005).

Different animals are under varying forms of protection based on sacred groves and taboos Snakes, however, except *Python regius* and to a lesser extent, *P. sebae* are killed on sight, mainly due to fear and the fact that most people in Ghana erroneously perceive all snakes as venomous and dangerous (Attuquayefio, 2004). In some communities in Northern Ghana, pythons, monitor lizards

and crocodiles are tabooed animals which are not killed by the people. For instance, the Paga Crocodile Pond in the Upper East region of Ghana, is a popular tourist attraction. Some rituals are performed by the keepers of the pond, after which the crocodiles are called out of the water for people to play with them, sit on them and take photographs, etc. People in the twin towns of Boabeng and Fiema in the Brong-Ahafo region of Ghana live and interact with monkeys on a daily basis. The monkeys are fed and cared for by the town folk when they visit homes, and they are buried in a cemetery after customary rites are performed when they die (Attuquayefio and Gyampoh, 2010).

Disregard of taboos attracts severe punitive sanctions to culprits and high prices of atonement including making sacrifices and performing certain rites to avert any future mishap (Attuquayefio and Fobil, 2005). Unfortunately, this has not been effective deterrent to the destruction of biological diversity mainly due to rapid population growth, influence of foreign religions and beliefs and increased dependence on western technology.

Conclusion

While many herpetofaunal species thrive in anthropogenically disturbed areas, others do not survive intense habitat destruction because of their restriction to specific microhabitats (Leach et al., 2006). Preserving riparian vegetation bordering streams and rivers will be one of the most effective methods of conserving the herpetofaunal community in the study area. As important inhabitants of tropical ecosystems, amphibians are extremely sensitive to habitat alteration. The composition of herpetofauna assemblages is known to reflect the degree of habitat degradation and destruction. The presence or absence of particular herpetofaunal species could thus form the basis of conservation and management recommendations (Leache et al., 2013). The flattened species accumulation curve indicates that the most common herpetofaunal species had been encountered, and future long-term monitoring programmes could focus on such species. The results of this survey could be useful in baseline monitoring however, there is the need for a more exhaustive study to build upon this study.

Conflict of Interests

The authors have not declared any conflict of interests.

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Full Length Research Paper

Inside the commons of ecotourism development in Ethiopia: Strategic communal empowerment or marginalization? Evidence from Wenchi community based ecotourism

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This paper examines the quest of empowerment and disempowerment, the way community based ecotourism created the marginalized community throughout its development phase in Ethiopia with evidence from Wenchi Ecotourism development. Descriptive research design was employed where as random sampling and purposive sampling techniques were used to determine the sample size. The sample representative for the study was 221 samples (196 for local community, 12 guides, 3 experts and 10 community representatives). Interview, focused group discussion, questionnaire and participant observation were used as a data collection instruments. In order to collect the data, community, government officials, and community representatives were a source of data where the sample size was determined by simple random sampling for local community and purposive sampling for the rest. Despite its significant contribution to livelihood augmentation, the finding indicated that Wenchi community based ecotourism created a two group of community: the empowered and the marginalized on the commonly owned resources. Even though the lake is a common pool resource, those members of the community who are beneficiary from ecotourism were the key player and powerful in decision making concerning the lake and its surroundings. Besides, out of 400 households around the lake, only 334 households were incorporated to the ecotourism association which was the reason for the formation for empowerment or disempowerment and resulted in formation of minority on commonly owned resources. Moreover, social network, norms and social trust that facilitates coordination and mutual benefits for environmental conservation and protection is being eroded.

Key words: Ecotourism, empowerment, commons, marginalization, Wenchi.

INTRODUCTION

Tourism is one of the world's largest and fastest growing industries. It contributes 5% of the world's GDP and 7%

of jobs worldwide. It accounts for 6% of the world's exports and 30% of the world's exports in services where

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tourism generates 45% of the total exports in services in developing countries (World Tourism Organization, 2012). Despite its obscurity, Ethiopian tourism industry shows a significant paradigm shift during the previous period. The history of Ethiopian tourism has been showed a significant growth rate since the imperial periods. Even though ecotourism is at its infant stage, it has shown a significant development in Ethiopia. Besides different impediment, ecotourism has considered as an appropriate strategy for livelihood step up; empowerment of marginalized community and nature conservation while recreating the tourists (Lascuráin, 1988; Fennell, 1999; Liu, 1991). Apart from its value to local community, they are still excluded in making decisions of tourism projects at their doorsteps (Irmgard, 2014).

In the year 1950s and 1960s, community development was introduced to ensure community involvement in decision making, implementation and made them beneficiary from developments (Sebele, 2010). A heavy competition over land and resources resulted in deprive of rural communities of control over and access to the territories and natural resources across Africa (Fred, 2010). As a need to ensure community empowerment, Ethiopian tourism development policy encourages community participation to ensure the sustainable development of the community (Ethiopian Ministry of Culture and Tourism, 2009). Despite brainwave at policy level, community participation is limited where large companies dominated the business particularly from the centre resulted in marginalization of the community in line with uncoordinated management of such resources at grass root.

Despite the competing interests on resource sharing, local empowerment is the basic for the sustainable development of Ecotourism (Isaac and Wuleka, 2012). In Contrary, indigenous people whose survival depends heavily on natural resource may perceive tourism as a threat that deprives them (Ross and Wall, 1999); the mere fact beyond what is on the ground is the participation of local community as an essential component for the friendly relationship between tourism and environment (Wahab, 1997). Likewise, community based approach to ecotourism recognizes the need to promote both the quality of life of people and the conservation of resources (Scheyvens, 1999). Hence, the inclusion of community wishes in tourism planning and development at grass root level helps the community to gain economic returns from the development (Murphy, 1985 cited in Sebele, 2010). It is argued that community based natural resource management results in 'win win situation' (Sebele, 2010) even though it is often unclear exactly who is to be empowered; the individual, the 'community', or categories of people such as 'women', 'the poor' or the 'socially excluded' (Cleaver, 1999). The livelihoods of African smallholder farmers are often constrained by poor access to markets and limited entrepreneurial skills for adding value to produce.

Conflicts between local groups and other more powerful actors, including both state agencies and private sector investors, remain widespread across the subcontinent and are often intensifying (Roe et al., 2009). In developing countries like Ethiopia where donors are the frontline role players for its establishment, there is a paradox in community empowerment. In spite of argument of empowerment, there is scant study on whether ecotourism development is a reason for empower community or marginalize community as a result of development phase of Ecotourism in Ethiopia. The finding pointed out that the segmented (partial) empowerment of the community which resulted in damage of the natural resources ecotourism depends. Thus, the main objective of the article is to assess community empowerment in the development phase of community based ecotourism of Wenchi Crater lake, Ethiopia.

MATERIALS AND METHODS

Study area

Wenchi Crater Lake is one of an impressive, wide and very steep lake in Ethiopia with its dramatic valley located in the central high land of Ethiopia, 155 Km South West of the capital, Addis Ababa. The lake and its surroundings are endowed with indigenous plant species including *Hyginia abyssinica*, *Juniperus procera*, *Olea Africana*, *Schefflera Abyssinica* and *Erica Arborea*. Furthermore, *Colobus guereza*, *Tragelaphus sylvaticus* are mammals that commonly seen whereas *Gyps Africanus*, *Milvus aegyptius*: black kites, *Bostrychia carunculata*, and *Tauraco leucotis* are some of the birds that can be seen. Wenchi Community Based Ecotourism introduced to the lake in 2003 by GTZ in collaboration with Oromiya trade and industry bureau.

Methods

Descriptive research design was employed to describe narration of facts and characteristics concerning individual, group or situation (Kothaire, 2004). The sample size was determined by the use of simple random sampling technique for questionnaire survey. Lewis (1994). Additionally, 10 community representatives, 12 guides and 3 experts selected via purposive sampling. Accordingly, 221 samples were the part of the study. Field observation, semi-structured interviews, focused group discussion and the analysis of documents have been the principal methods of data collection in order to assess community attitude towards ecotourism development of the lake, their level of empowerment and the problem created as a result of the development on the lake and its surroundings. The data were analyzed by the use of SPSS version 21 for quantitative data. A comprehensive questionnaire was developed by the researcher based on the information from different literature and studies and the questionnaire distributed to local community was translated into *Afan Oromo* language.

The data from questionnaires was analyzed through frequency, and percentages, and mean based on the study objectives, theoretical and conceptual frameworks using Likert scales of 5-points. Data collected through Interview was analyzed systematically and based on the techniques of listening and transcription, reduction to units of relevant meaning and summarization.

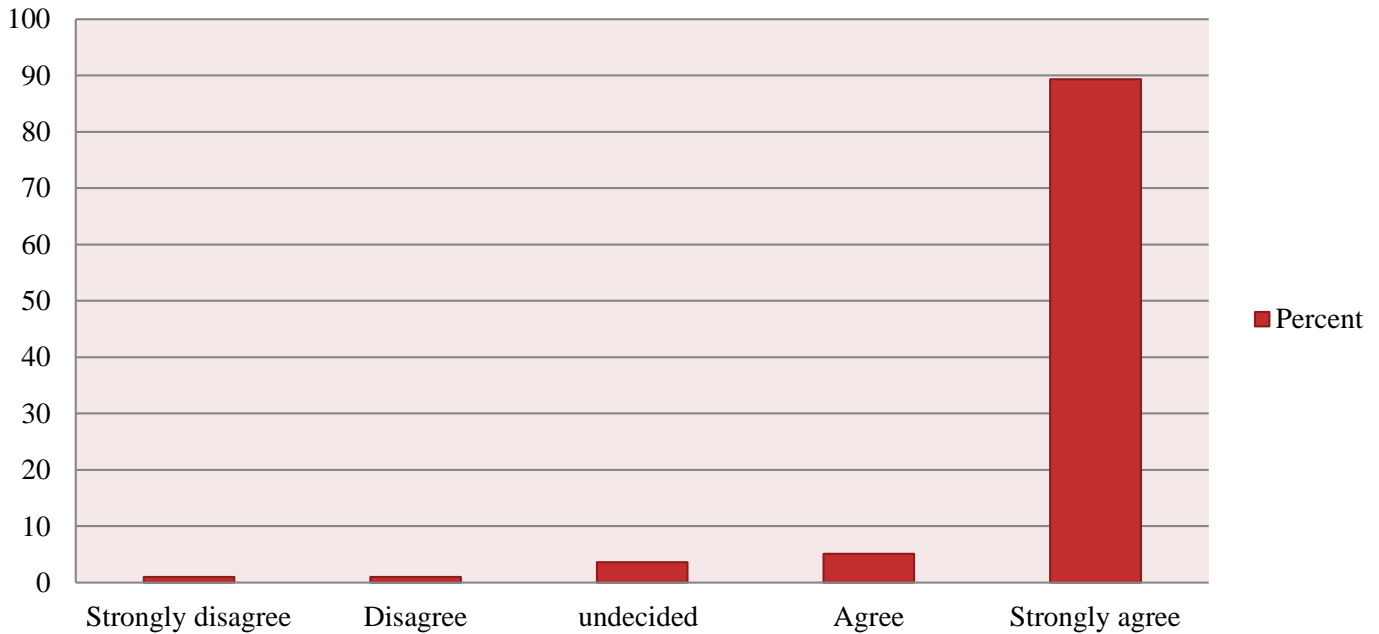


Figure 1. Community attitude towards ecotourism's value for the conservation of culture and nature.

Here ideas were refined and revised in the light of the information gathered.

RESULTS AND DISCUSSIONS

Community of Wenchi Crater Lake and its surrounding has a positive attitude towards ecotourism in which the majority (89.3%) believed that ecotourism helped them to value both the nature and their culture (Figure 1). However, the finding from interview and focused group discussion indicated that despite their appreciation of ecotourism, it caused marginalization of certain group. As a result, two scenarios (the majority and minority) were formed after the ecotourism project. This implies that before the establishment of ecotourism, both the empowered (majority) and marginalized (minority) was the co-owner of the natural resources nearby. Accordingly, Wenchi Crater Lake was the common pool resource of the two communities. In opposition to this, the majority (the empowered) is a decision maker, owner and beneficiary. One of the main reason for the failure of development projects at community level are inability to improve their life after being developed and not just a score on somebody's set of indicators (Irmgard, 2014). However, ecotourism is identified as a potential for empowering marginalized peoples, and conserving biodiversity (Honey, 1999; Scheyvens, 1999; Wearing and Neil, 1999). Apart from this, the finding from Wenchi Crater Lake revealed that community based ecotourism created two groups of people on the power to control the common

resources where the member of the association had a strong influence on decision made on both ecotourism development and the commonly owned resources.

Some authors argued that ecotourism is little more than conventional capitalism with a veneer of socially and environmentally responsible rhetoric (Isaacs, 2000; Duffy, 2002; Cater, 2006; Meletis and Campbell, 2007). Whether ecotourism is a silver bullet or fool's gold (Mills and Porras, 2002), panacea or Pandora's Box (Kruger, 2005), the question of how ecotourism affects the commons merits greater attention. Ecotourism may not only create a marginalized community but also can affect the social interaction between the one who is empowered and disempowered. Tourism as a community development exercise has been shown to create social tensions and disharmony (Wyllie, 1998; Wearing and McDonald, 2010 cited in Irmgard, 2014). Despite the direct benefits from ecotourism development to the lake, there were no strategies that ensure the benefits of the minority. The finding from the interview and field observation shows that there was an electric power, school, and health care for those who are the participant in ecotourism. However, the other side of the community was marginalized from the activity of ecotourism and benefits resulted from the development to the area.

On the other hand, the study showed that 86.3% of them believed that ecotourism improved their livelihood where as 91.5% of the respondents (n=196) believed that ecotourism can strengthen their power of ownership if developed in sustainable manner. And triangulation of data showed that communities who were not included in

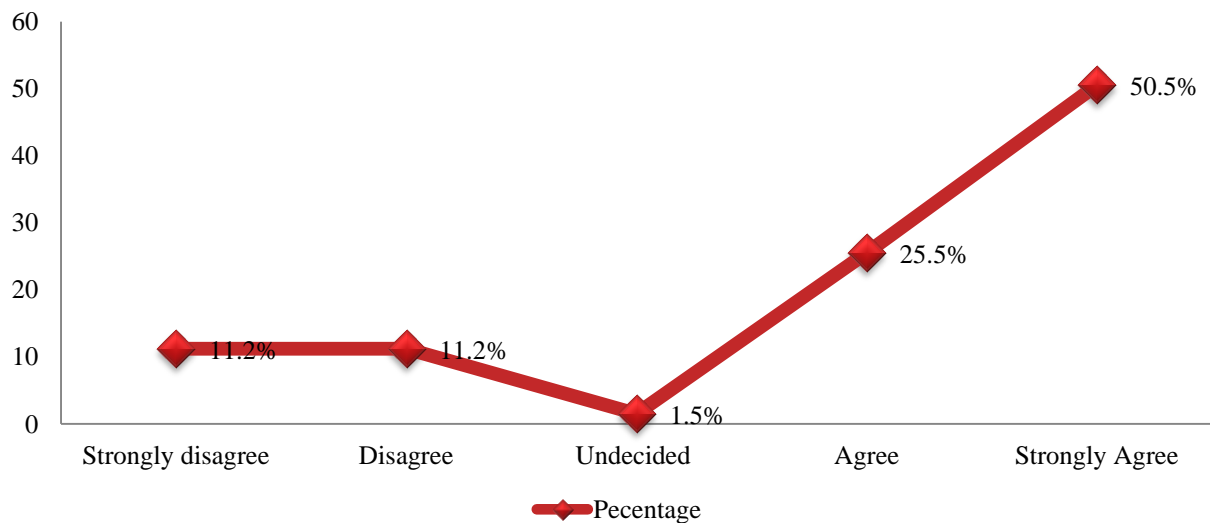


Figure 2. Community attitude towards Social interaction as a result of ecotourism.

the association also had positive attitude towards ecotourism. The community's views of social interaction (Figure 2) as a result of ecotourism development are almost good (50.5% of the respondents strongly agree). However, the interview with 25 Interviewee showed that the relation between those participant and not participant as well the ecotourism association leaders were not good. This can be seen in terms deforestation, deliberate farming of land nearby the lake, and the burning of temporary guest house built around the lake by unknown person.

Moreover, one of the main inclusion requirements is financial capacity to pay membership fee. Besides, in kind contribution may be considered. For instance, if somebody wants to join a boat group, he/she expected to own either a boat or pay membership fee determined by members of the association. This is the situation that made the empowered more empowered and the disempowered more disempowered. This is confirmed with the finding of Stronza (2010) which revealed expanded individual production and extraction, and a new spirit of individualism weaken the traditional social relations and institution, conservation ethics that promotes communal ownership among the community.

The historical background of the association shows that ecotourism to the area was a GTZ financed project in collaboration with Oromia trade and industry Bureau to enhance the livelihood of the community of Wenchi. This may imply that the developers designed the association either where certain group of community did not aware the significance of ecotourism to their livelihood or the developer developed in the way that suits their development policy. This is similar to Cornwall's finding which revealed the process of selection; exclusion and self-exclusion of potential participants are utilized by development actors (Cornwall, 2008).

Power controversy among the association, community and the newly established monastery were also another challenging problem of the lake; the association and the monastery has two different receipts for boat service .i.e. the monastery gives receipt freely in order you can pass by boat to the other side of the lake. However, the boat service providers never allow you to use the service without payment. The monetary benefit beyond power struggle and the intervention of the monastery in ecotourism activity of the lake leads to the conflict of interest between the association and monastery. Furthermore, the interview with boat service provider revealed that the newly established monastery leader is selling charcoal in spite of allowing the community to use the boat service freely. Beyond this controversy, the boat service providers react in opposition to the newly established monastery as they are selling charcoal by ignoring the policy of ecotourism association of the lake. As a result of power controversy among conflicting party, the need for biodiversity conservation and livelihood enhancement, the natural resource is exploited and deteriorated at the middle if the conflicting parties are not reach agreement. When commonly owned natural resources are modified by ecotourism, the long term conservation depends on the price relative to other values of resources. On the other hand, due the inability of ecotourism to support their livelihood and short of land for agriculture in rural areas, the community forced to do so. There is discrepancy between the young and elder on relocation where the youngsters were looking for relocation and resettlement in which they stated their views in the following ways:

"Even though we need to be beneficiary from ecotourism of the lake, we could not be included in the association for our inability to pay entrance fee to the association and

supplementary equipment like horse, boat and others. We do not have a sufficient land to plow but forced to cut tree and other illegal activities on the environment. We asked the government officials to relocate and resettle, but remain unanswered.”

Contrarily, according to interview with elders, they were not looking for resettlement and relocation for the following reasons:

“It is our land and we are indigenous to the area and our fore fathers are also inhabited here where the area is the burial place of our ancestor’s Liban clan of Waliso Oromo. We could not need to resettle other place. We could not survive in another area as we are adapted to the climatic condition of Wenchi.”

The rules and regulation of Wenchi Ecotourism articulates that the member of the association should avail themselves for the better servicing of the customer. If not, they may be deprived of the benefits they are expected to gain from the service during that particular date. Even during the off season, they are expected to do so. Therefore, they were the victim of the seasonality nature of ecotourism which may have an adverse impact on their livelihood. Similar finding by Stronza (2005) confirmed that the price value placed on a resource may be the source of its demise rather than its long-term stewardship. Even though they can engage on another economic activity like trade, agriculture and others, they have to wait all the day for tourist since they do not know when customers came as there is no means of pre-reservation in order to provide a pre-arranged service to various customers and the society in general. This may be due to the domains of community participation are pre-determined and may not include domains relevant to the local people (Laverack, 2003; 2006). In the same way finding from Canada revealed that if a tourism enterprise does not consider local everyday life in its planning, deterioration of the tourism product, conflict between locals and entrepreneurs and, of most concern, community dysfunction will occur (Reid et al., 2000). Moreover, Botes and Rensburg’s (2000) identified the paternalistic role of development professionals, the inhibiting and prescriptive role of the state, an over-reporting of development successes, selective participation, hard-issue bias, conflicting interest groups within communities, gate-keeping by local élites, pressure for immediate results, and a lack of public interest as a barriers to community based developments. As a result, if the community based development is not developed from the community’s perspectives and interests from the very beginning, it results in the failure of the project objectives where the emphasis can be shifted to the resolution of the ownership problem and others beyond the primary goal of the project.

Conclusion

The finding suggests that instead of project developer’s interest and objective, the broad social interest of the commons in line with the biodiversity conservation should be considered in advance. Even though community Based ecotourism has a greatest potential to empower the community, care must be given to who should be incorporated and not since absence of a single group of people expected to be incorporated can have an adverse impact on sustainability of the ecotourism projects, biodiversity conservation and mutual relationship. As a result, the sustainable development of community based ecotourism can create a disempowered people beyond their communal management of natural resources if not considered during the initial stage of the project.

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