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Ecotourism development in Ikogosi Warmspring, Ekiti State, Nigeria: Implication on woody species composition and structure

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ABSTRACT

The high rate of infrastructural development in Ikogosi warmspring towards harnessing her enormous ecotourism potentials calls for a serious concern. The study aimed at identifying the past and present status of ecotourism facilities, determining and comparing the woody species composition and structure of the built- up and/or recreational areas and undeveloped areas of Ikogosi Warmspring, Nigeria. Interview method and field observation were used to identify the past and present status of infrastructural development. Quadrant method was employed to determine the phyto-sociological characteristics - woody tree species composition, diameter at breast height, height, abundance, richness and diversity. Significant level of vegetation indices was tested using T–test analysis. The result revealed 21 families of 49 different woody tree species with total frequency of 117 in the built- up and/or recreational areas while in the undeveloped areas, 25 families of 67 different woody tree species with total frequency of 203 were observed. Despite the slight reduction in richness and diversity of the woody tree species, eco-friendliness must be initiated in the planning process, so as to ensure environmental sustainability of the Warmspring's vegetation through locating infrastructural development in less sensitive areas such as degraded land and fallow forest within the tourist site.

Keywords: *Warmspring, infrastructural development, vegetation, ecotourism, eco-friendliness*

INTRODUCTION

Forest areas surrounding water springs in developing countries should usually be seen as recreational assets, due to their high capability of regulating ecological processes. They are important places for the protection of ecological systems and natural resources as well as for the provision of recreational and tourism opportunities for the people (Boyd, 2006). Its potentials for environmental serenity – a means of tourist attraction – cannot be underestimated. Coupled with the fact that there are greater opportunities for government to generate sufficient funding from ecotourism development of springs; either warm or cold.

Despite the tourism potentials to provide economic development, through the provision of increased income and employment, conserving nature and funding for maintenance of protected areas (Bhuiyan *et al.*, 2011), natural resources at tourism destinations and sustainable tourism development are growing topics in the tourism literature (Hassan, 2000). Growing concern for conservation and the well-being of the environment over the past two decades have brought about a closer relationship between the environment and tourism (Reynolds and Braithwaite, 2001).

The term "warm spring" relates to all kinds of groundwater that are heated by the normal terrestrial heat gradient (Mazor, 2004). In Nigeria, there are many known thermal springs located in the Benue trough, with an exception of Ikogosi warm spring situated outside the Cretaceous Benue trough (Oladipo *et al.*, 2005). Springs provide a habitat for specialised organisms that are adapted to the relatively constant environment (Ellenberg, 1996). Therefore, they provide beautiful scenery for ecotourism development. Although, with Nigeria's reported shift in emphasis to tourism as a means of augmenting revenue from crude oil (Osunsina *et al.*, 2008), ecotourism sub- sector in Nigeria is still at a developmental phase.

Large percentage of Nigeria's environment is degraded, with less than 4% of the once-lush rainforest left; desertification is an increasing threat across Nigeria, leaving most of the country without the option of ecotourism (Hochachka and Liu, 2005). Rapid growth of nature-based tourism had brought about the development of numerous lodges in biologically rich, diverse areas. Such developments often have had detrimental ecological and social impacts (Blangy and Mehta, 2006). Forests in Ikogosi Warmspring are valued for their high biodiversity, ecosystem, historical and ecotourism important value (Ogunjemite *et al.*, 2013). An in-depth knowledge of the richness, diversity, and species composition of plant community formations is vital for providing support to planning and conservation actions that can reduce the environmental impacts of development (Rodrigues and Leitão Filho, 2000; Wu *et al.*, 2003). Although, the high rate of infrastructural development in Ikogosi Warmspring by Ekiti State Government towards harnessing her great ecotourism potentials is a welcome development and giant stride in resuscitating the moribund tourism sector in the state, but this spate still calls for a serious concern. This study aimed at identifying the past and present status of infrastructural development, determining and

comparing the woody species composition and structure of the recently built- up and/or recreational areas and areas of Ikogosi Warmspring, Nigeria.

METHODOLOGY

Study area

Ikogosi Warmspring is located in Ekiti State, Nigeria (Figure 1). Geographically, it is situated between latitude 7^0 35' North and longitude 4^0 59' East. The area enjoys tropical climate with two distinct seasons – rainy season (April – October) and the dry season (November – March). Temperature ranges between 21^0C and 28^0C with high humidity. It lies on an area underlain by metamorphic rock. Moreso, it is generally undulating with a characteristics landscape that consists of old plains broken by step- sided out-crops that may occur in groups of ridge. Such rock out-crops exist mainly in Aramoko, Efon-Alaaye, Ikere-Ekiti, Igbara-Odo Ekiti, and Okemesi-Ekiti (Ogunjemite *et al.,* 2013).

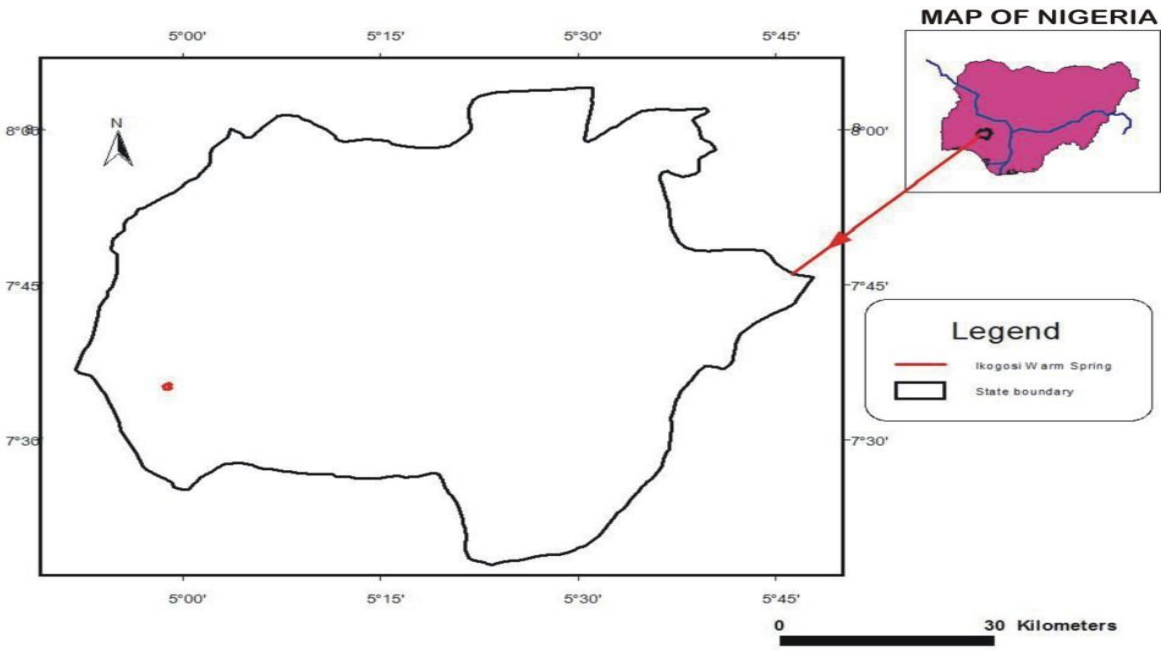

Figure 1: Location of Ikogosi Warmspring in Ekiti State, Nigeria (Source: Ogunjemite *et al.,* 2013).

Data collection

The study was undertaken between January, 2012 and February, 2014. Prior to 2012, Ekiti State government was yet to commence the re-construction of the ecotourism facilities in the study area. Interview method and field observation were used to identify the past and present status of infrastructural development in Ikogosi Warmspring, Nigeria respectively. Therefore, the staff, Ikogosi site construction workers, engineers and supervisors were interviewed to have the inventory of the past and present ecotourism facilities in Ikogosi Warmspring, Nigeria before 2012. The present status was obtained through field observation. The occurrence present or absent) and condition (constructed, re-constructed or dilapidated) past and present status of infrastructural development were obtained. Quadrant method was used in the woody vegetation assessment (FAO, 2009) to determine the impact of the ecotourism facilities on the woody species. Ten plots were selected from built-up/ recreational and undeveloped areas. Five 25 × 25 m^2 plots were marked out in each of the areas to determine and compare the woody species composition and structure of the recently built- up/ recreational areas and undeveloped areas of Ikogosi Warmspring, Nigeria. For every plot on built-up/ recreational area, a control plot was marked at interval 50m – 100m in the undeveloped area within the same altitude above sea level using meter rule and hand-held Global Positioning System (Garmin 78S). The following phyto-sociological characteristics were examined: woody species composition, family composition, frequency of occurrence, height and diameter at breast height.

Data analysis

Data on past and present status of infrastructural development were subjected to descriptive statistics, while comparison in the woody species composition and structure - species richness, abundance, Shannon Werner diversity index - of the recently built- up/ recreational areas and undeveloped areas, and comparison of vegetation indices by T–test analysis were computed using R Commander and BiodiversityR packages in R 3.0.1 software at 95% confidence limit.

RESULTS

Ecotourism facilities' inventory of Ikogosi Warmspring, Nigeria before 2012 and presently was presented in Table 1. Five infrastructures were available before 2012 - Executive VIP chalet, VIP villas, western suites, standard rooms of different styles, themes and offerings, and warm water swimming pool – and all were in dilapidated condition. Presently, the five dilapidated structures had been re-constructed, while additional nine infrastructures were constructed.

Table 1: Ecotourism facilities' inventory of Ikogosi Warmspring, Nigeria before 2012 and presently

Infrastructures	Status before 2012		Present status	
	Occurrence	Condition	Occurrence	Condition
Executive VIP chalet	√	Dilapidated	√	Re-constructed
VIP villas	√	Dilapidated	√	Re-constructed
Western suites	√	Dilapidated	√	Re-constructed
Standard rooms of different styles, themes & offerings	√	Dilapidated	√	Re-constructed
Double standard rooms for students on excursion and campers	-	-	√	Constructed
Restaurant/Bar	-	-	√	Constructed
Warm water swimming pool	√	Dilapidated	√	Re-constructed
Nature spa / beauty centre	-	-	√	Constructed
Gym/Fitness shop	-	-	√	Constructed
Herbal shop for local medication	-	-	√	Constructed
Arts and Crafts shops for souvenir items	-	-	√	Constructed
300-seat multi-purpose conference hall	-	-	√	Constructed
120-seat and 50-seat meeting and function rooms	-	-	√	Constructed
Variety/shopping mall	-	-	√	Constructed
Amphitheatre	-	-	√	Constructed
300-car parking facility	-	-	√	Constructed
Open green areas	-	-	√	Constructed
Brook walk lanes	-	-	√	Constructed
Relaxation spots	-	-	√	Constructed
Staff quarters	√	Dilapidated	√	Re-constructed

√ means "present", - means "absent"

The result revealed 21 families of 49 different woody tree species with total frequency of 117 in the built- up/ recreational areas (Table 2, Figure 2) including richness and Shannon diversity index of 49 and 3.51 respectively, while in the undeveloped areas, 25 families of 67 different woody tree species with total frequency of 203 (Table 3, Figure 2) including richness and Shannon diversity index of 67 and 3.83 respectively were observed. In the developed/ recreational area, three families had the highest number of species (5) each – Apocynaceae, Leguminosae and Sterculiaceae, while the woody tree species with the highest frequency was *Nesogordonia papaverifera* (16). In the undeveloped area, family leguminosae had the highest number of species (10), followed by family Apocynaceae (8), while the woody tree species with the highest frequency was *Elaeis guineensis* (16), and followed by *Albizia zygia* (15).

Table 2: Woody vegetation in the developed/ recreational area of Ikogosi Warmspring, Nigeria

Family	**Species**	**Frequency**
Agavaceae	*Dracaenia spp*	1
Anacardiaceae	*Magnifera indica*	1
	Spondias mombin	2
Annonaceae	*Cleistopholis patens*	1
Apocynaceae	*Alstonia bonei*	1
	Funtumia elastica	8
	Holarrhena floribunda	5
	Picralima nitida	7
	Rauvolfia vomitora	1
Aquifoliaceae	*Musanga cecropioides*	9
Bignoniaceae	*Neubouldia laevis*	1
Bombacaceae	*Ceiba pentandra*	1
	Ochroma lagopus	1
Burseraceae	*Canarium schweinfurthii*	1
Combretaceae	*Terminalia glaucescens*	3
	Terminalia superba	1
Ebenaceae	*Diospyros mespiliformis*	3
Euphorbiaceae	*Alchornea couldifolia*	1
	Bridelia sternocarpa	1
	Ricinodendron heudolotii	1
Leguminosae	*Albizia ferruginea*	1
	Albizia zygia	1
	Berlinia auriculata	2
	Pentaclethra macrophylla	3
	Piptadeniastrum africanum	5
	Pterocarpus osun	1
Meliaceae	*Azadirachta indica*	2
	Entandrophragma cylindricum	1
	Khaya grandifolia	1
Moraceae	*Bosqueia angolensis*	1
	Ficus goliath	2
	Treculia Africana	2
Oleaceae	*Anthocleista schweinfurthii*	1
Palmae	*Elaeis guineensis*	1
	Raphia hookeri	5
	Raphia longiflora	3
	Raphia vinifera	1
Rubiaceae	*Mitragyna stipulosa*	4
Rutaceae	*Fagara leprieurii*	1
Sapotaceae	*Chrysophyllum mumbuli*	1
	Chrysophyllum albidum	1
Sterculiaceae	*Cola acuminata*	2
	Cola hispida	1
	Nesogordonia papaverifera	16
	Sterculia tragacantha	3
	Triplochiton scleroxylon	1
Verbenaceae	*Gmelina aborea*	3
	Tectona grandis	1

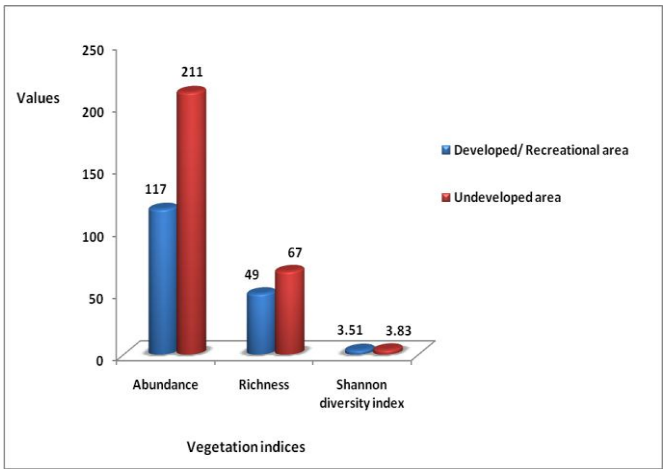

Figure 2: Vegetation indices between the developed/ recreational and undeveloped areas of Ikogosi Warmspring,

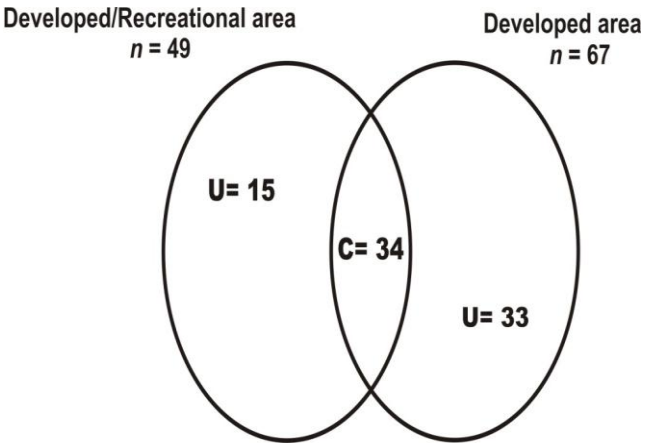

Figure 3: Venn diagram showing the total numbers of species recorded in each area (*n*), the numbers of unique species (U), and those common (C) to developed/ recreational and undeveloped areas of Ikogosi Warmspring

Venn diagram showing the total numbers of species recorded in each area (*n*), the numbers of unique species (U), and those common (C) to developed/ recreational and undeveloped areas of Ikogosi Warmspring, Nigeria was presented in Table 3. The earlier had the least number of unique woody species (15), while the later had the highest number of unique woody species (33). The study area recorded thirty four (34) woody species common to developed/ recreational and undeveloped areas. Average mean and standard error of the woody species' height in the two areas (Figure 4) was the lower in undeveloped area (15.30 ± 1.70m) and higher in developed/ recreational area (18.10 ± 2.10m). Mean and standard error of the diameter at breast height of woody vegetation (Figure 5) was the higher in undeveloped area (11.70 ± 1.20m) and lower in developed/ recreational area (10.50 ± 1.10m). Although, the mean diameter at breast height of woody trees in the undeveloped areas appeared to be higher, it was not significant (T value = -0.74, P = 0.46). Also, the mean trees height of the built- up/ recreational areas appeared to be higher, but it was not significant (T value = 1.04, P = 0.30).

Table 3: Woody vegetation in the undeveloped area of Ikogosi Warmspring, Nigeria

Family	**Species**	**Frequency**
Agavaceae	*Desplatsia dewevrei*	1
	Dracaenia spp	2
Anacardiaceae	*Spondias mombin*	1
Annonaceae	*Cleistopholis patens*	2
Apocynaceae	*Alstonia boonei*	4
	Alstonia cogensis	1
	Funtumia africana	4
	Funtumia elastica	5
	Holarrhena floribunda	5
	Hunteria umbellate	1
	Picralyma nitida	3
	Rauvolfia vomitora	1
Aquifoliaceae	*Musanga cecropioides*	4
Balanitaceae	*Alchornea cordifolia*	1
Bignoniaceae	*Neubouldia laevis*	1
Bombacaceae	*Ceiba pentandra*	1
	Ochroma lagopus	1
Combretaceae	*Terminalia ivorensis*	4
Ebenaceae	*Diospyros mespiliformis*	2
Euphorbiaceae	*Bridelia sternocarpa*	1
	Macaranga barteri	5
	Phyllanthus discoideus	1
	Ricinodendron heudolotii	2
Guttiferae	*Harungana madagascariensis*	2

Family	Species	Frequency
Leguminosae	*Albizia ferruginea*	10
	Albizia zygia	15
	Berlinia auriculata	3
	Brachystegia eurycoma	2
	Daniella ogea	1
	Gliricidia sepium	1
	Milletti thonningii	1
	Pentaclethra macrophylla	5
	Piptadeniastrum africanum	3
	Pterocarpus osun	2
Meliaceae	*Entandrophragma cylindricum*	5
	Entandrophragma utile	1
	Khaya grandiofoliola	1
Moraceae	*Antiaris africana*	1
	Bosqueia angolensis	3
	Ficus exasperata	1
	Ficus goliath	1
	Milicia regia	1
	Myrianthus arboreus	2
Myristicaceae	*Pycanthus angolensis*	2
Olacaceae	*Strombosia pustulata*	12
Oleaceae	*Anthocleista djalonensis*	2
	Anthocleista schweinfurthii	2
Palmae	*Elaeis guineensis*	16
	Raphia hookeri	11
Rubiaceae	*Mitragyna ciliata*	2
	Mitragyna stipulosa	2
	Nauclea diderrichii	1
	Nauclea latifolia	2
	Rothmania lujae	2
Sapindaceae	*Blighia sapida*	2
	Lecaniodiscus cupanoides	3
Sapindaceae	*Blighia sapida*	2
	Lecaniodiscus cupanoides	3
Sapotaceae	*Chrysophyllum albidum*	1
Sterculiaceae	*Cola acuminata*	6
	Cola mellenii	3
	Sterculia tragacantha	2
	Theobroma cacao	6
	Triplochiton scleroxylon	1
Ulmaceae	*Celtis zenkeri*	5
	Trema orientalis	4
Verbenaceae	*Vitex doniana*	2

Relative density of the unique woody species in the developed/recreational and undeveloped areas of the study area was shown in Table 4. It ranged between 1.26 – 6.71% in the developed/recreational area with *Gmelina aborea* having the highest. In the undeveloped area, it ranged between 1.26 – 6.71% with *Entandrophragma cylindricum* having the highest

Table 4: Relative density of the unique woody species in the developed/recreational and undeveloped areas of Ikogosi Warmspring

Species Composition	**Developed/Recreational area**	**Undeveloped area**	**Relative density (%)**
Alstonia cogensis	-	√	1.26
Anthocleista djalonensis	-	√	2.53
Antiaris africana	-	√	1.26
Azadirachta indica	√	-	1.26
Blighia sapida	-	√	2.53
Brachystegia eurycoma	-	√	2.53
Buatanga spp	√	-	1.26
Canarium schweinfurthii	√	-	1.26
Carpolopic lutec	-	√	1.26
Celtis zenkeri	-	√	3.16
Cleisotophyllum mumbuli	√	-	1.26
Cola hispida	√	-	1.26
Cola mellenii	-	√	1.90
Daniella ogea	-	√	1.26
Desplatsia dewevrei	-	√	1.26
Entandrophragma cylindricum	-	√	6.32
Fagara leprieurii	√	-	1.26
Ficus exasperata	-	√	1.26
Funtumia africana	-	√	3.16
Gliricidia sepium	-	√	1.26
Gmelina arborea	√	-	6.71
Harungana madagascariensis	-	√	2.53
Hunteria umbellata	-	√	1.26
Lecaniodiscus cupanoides	-	√	3.79
Macaranga barteri	-	√	2.13
Magnifera indica	√	-	1.90
Microphylla arboreus	-	√	2.92
Milicia regia	-	√	1.26
Milletti thonningii	-	√	1.26
Mitragyna ciliata	-	√	1.26
Myrianthus arboreus	-	√	2.53
Nauclea diderrichii	-	√	1.26
Nauclea latifolia	-	√	2.53
Nesogordonia papaverifera	√	-	1.26
Phyllanthus discoideus	-	√	1.26
Pycanthus angolensis	-	√	2.53
Raphia longiflora	√	-	1.26
Raphia vinifera	√	-	1.26
Rothmania lujae	-	√	1.26
Strombosia pustulata	-	√	5.06
Tectona grandis	√	-	3.16
Terminalia glaucescens	√	-	1.26
Terminalia ivorensis	-	√	2.53
Terminalia superba	√	-	2.53
Theobroma cacao	-	√	2.53
Treculia africana	√	-	1.26
Trema orientalis	-	√	1.66
Vitex doniana	-	√	1.26

- and √ signifies the absence and presence of unique species within different sampling areas respectively

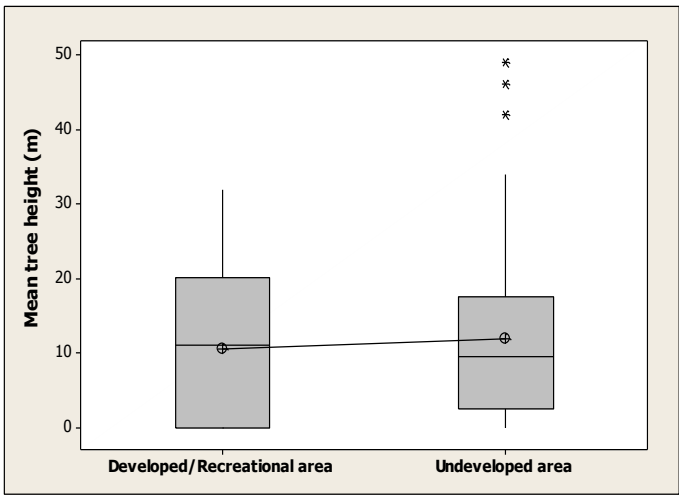

Figure 4: Mean and standard error of the woody species' height in developed/recreational and undeveloped areas of Ikogosi Warmspring

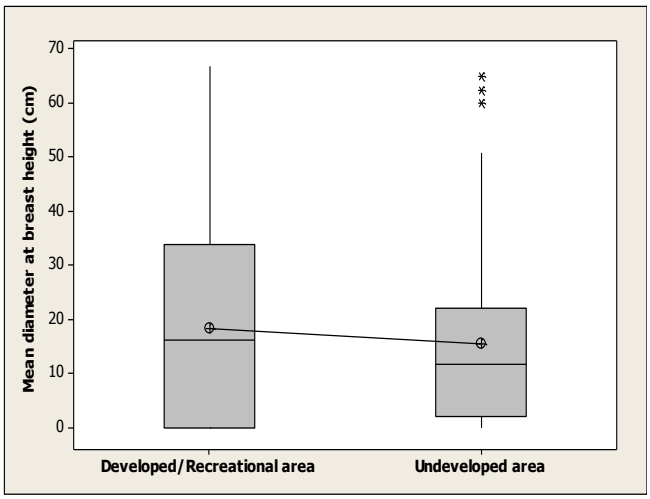

Figure 5: Mean and standard error of the diameter at breast height of woody vegetation in developed/ recreational and undeveloped areas of Ikogosi Warmspring

DISCUSSION

Woody species composition and diversity

Despite the present stride of Ekiti State government to develop the ecotourism potentials of Ikogosi Warmspring, the study revealed the depletion in the rich and diverse ecosystem of the ecotourism destination as compared to other ecotourism sites within similar vegetation zones in Southern Nigeria. Sixty seven species from twenty five families were recorded in Okomu National Park (Oduwaiye *et al.*, 2002), 102 tree species from 35 families in Afi Mountain Wildlife Sanctuary (Edet *et al.*, 2012), and 57 tree species from 28 families in International Institute of Tropical Agriculture Forest Reserve (Oladoye *et al.*, 2014). These ecotourism destinations had a higher number of woody species and families compared to the built –up and/or recreational areas of Ikogosi Warmspring. This depletion cannot be unconnected to unconscious efforts undertaken by the Ikogosi community/Baptist missionaries in time past and Ekiti state government recently to harness its ecotourism potentials as substantiated by Ogunjemite *et al.* (2013).

Most of exotic species such as *Azadicrachta indica*, *Tectona grandis*, *Terminalia superba*, *Gmelina arborea*, *Elaeis guineensis*, *Mangifera indica* and so on were observed to have high relative density – a parameter for plant community analysis – in the built- up/ recreational area of the study location. However, based on Ogunjemite *et al.* (2013) assertions who opined that the incoming of missionary priest in the early management of the site was demonstrated by the occurrence of these species, it can be inferred that human activities had taken place in time past. Much more, the occurrence of IUCN red list species (*Entandrophragma cylindricum)* with highest relative density in the undeveloped area of Ikogosi Warmspring signified a great potential for flora conservation and invariably, wildlife management.

Infrastructural development and impact on vegetation

With the increasing interest of Ekiti State Government to transform the ecotourism sector in the state has come the development of numerous infrastructures in biologically rich and ecologically diverse Ikogosi Warmspring. This high and favorable political-will had been a panacea to meaningful ecotourism development in the study area. According to Blangy and Mehta (2006), such developments often have had detrimental ecological and social impacts. The developmental process had involved destruction of few woody vegetation species in the developed/ recreational area, serious threat to the ecological sustainability of the site. In Amboseli National Park and Masai Mara National Reserve, Kenya, the ecological destructive capability of ecotourism development was also reported by Okech and Bob (2009). Although, the increase in numbers of infrastructures is inevitable in an ecotourism destination, if the aesthetic values of an ecotourism site is to be maximally utilized. Construction materials and framework for the design/development of these structures has to be eco- friendly. Most especially, the negative impacts of the constructed brook walk lanes were not properly mitigated. This brought about the loss of woody vegetation species such as *Brachystegia eurycoma, Daniella ogea, Gliricidia sepium, Milletti thonningii, Pterocarpus osun, Entandrophragma cylindricum,* amidst others. *Entandrophragma cylindricum* – an IUCN vulnerable species had been exploited in the built-up/ developed area in time past possibly due to human activities such as farming and ecotourism development. This was in consonance to the findings of Pickering and Hill (2007) on the impacts of recreation and tourism on plants in protected areas in Australia, who asserted that rare and threatened plants and plant communities are often very sensitive and vulnerable to damage caused by infrastructural development. There was slight reduction in richness and diversity of the woody tree species in the built- up/ recreational areas as compared to the undeveloped areas – a sign of forest degradation. This

phenomenon reflected the destructive intense of infrastructural development on the woody species composition and structure of Ikogosi Warmspring when not properly planned.

The low species richness and diversity parameters of woody tree species in the built- up/ recreational areas could have important implications for species conservation since this area may not be adequate to offset the environmental impacts of infrastructural development in Ikogosi Warmspring. Environmental Impact Assessment of the tourism was confirmed to be undertaken, but appropriate measures to mitigate the negative ecological impact of infrastructural development were not inculcated into the Environmental Impact Statement.

CONCLUSION AND RECOMMENDATIONS

Redevelopment through reconstruction of dilapidated structures was a positive step to reduce human impact on the natural systems of Ikogosi Warmspring. However, Ekiti State tourism board must be more ecologically conscious in consequent development. Most especially, in execution of the proposed second developmental phase of Ikogosi Warmspring. Whenever possible, eco- friendliness must be initiated in the planning process, so as to ensure environmental sustainability. A fundamental goal for an ‘‘eco’’-oriented project is that the development of the site must leave the site better off after development than before. Reforestation, water resource enhancements, soil enrichment, wildlife protection and restoration programmes should be planned from the very beginning. Development should be concentrated in less sensitive areas – degraded land and fallow forest within the tourist site.

REFERENCES

Bhuiyan, M.A.H., Siwar, C., Ismail, S.M., and Islam, R. (2011): Ecotourism Development in Recreational Forest Areas. *Am J of Appli Sci.,* 8 (11): 1116-1121

Blangya, S.B., and Mehta, H. (2006): Ecotourism and ecological restoration. *Journal for Nature Conservation*, 14:33-236

Boyd, S.W. (2006): The TALC model and its application to national parks. In: The Tourism Area Life Cycle: Applications and modifications, R.W. Butler (Eds.). Channel View Publications Clevedon; pp119-138.

Edet, D.I., Ijeomah, H.M. and Ogogo, A.U. (2012): Preliminary assessment of tree species diversity in Afi Mountain Wildlife Sanctuary, Southern Nigeria. *Agric. Biol. J. N. Am*., 3(12): 486-492. :10.5251/abjna.2012.3.12.486.492

Ellenberg, H. (1996): Vegetation Mitteleuropas mit den Alpen in ökologischer, dynamischer und historischer Sicht. 5. Ulmer, Stuttgart; pp1095.

FAO. (2009): FAO National Forest Monitoring and Assessment. Manual for Local Level Assessment of Land Degradation, Sustainable Land Management and Livelihoods, Land Degradation Assessment In Drylands (LADA) Project; pp 39- 66

Hassan, S.S. (2000): Determinants of market competitiveness in an environmentally sustainable tourism industry. *J. Travel Res.,* 38: 239-245. DOI: 10.1177/004728750003800305

Hochachka, G. and Liu, S. (2005): Ecotourism in Cross River State, Nigeria. Canadian Institute of Sustainable Living, pp22

Kindt, R. And Coe, R. (2005): Tree diversity analysis: A manual and software for common statistical methods for ecological and biodiversity studies. Nairobi: World Agroforestry Centre (ICRAF); pp205.

Mazor, E. (2004): Global Water Dynamics – Shallow and Deep groundwater, Petroleum Hydrology, Hydrothermal Fluids and Landscaping. Marcel Decker Publ.; pp 292-328.

Oduwaiye, E.A., Oyeleye, B. and Oguntala, A.B. (2002): Species Diversity and Potentiality for Forest Regeneration in Okomu Permanent sample plot: Forestry and Challenges of Sustainable Livelihood, Proceedings of the 28th Annual Conference of the Forestry Association of Nigeria, Akure, Ondo State, Nigeria, 4-8 November, 2002. pp 264-272.

Ogunjemite, B.G., Olaniyi, O.E. and Akinwumi, O.O. (2013): Maintenance of ecological integrity of a Warmspring site: The role of vegetation composition and cover of Ikogosi warmspring, Ekiti State, Nigeria. Proceedings of 36th Annual Conference on Green economy: Balancing Environmental sustainability and livelihoods in an emerging economy held at University of Uyo, Akwa Ibom State, Nigeria 4th- 9th November, 2013; pp553- 562

Okech, R.N. and Bob, U. (2009): Sustainable Ecotourism Management in Kenya. Ethiopian Journal of Environmental Studies and Management 2(1): 57-65.

Oladipo, A.A., Oluyemi, E.A., Tubosun, I.A., Fasisi, M.K. and Ibitoye, F.I. (2005): Chemical Examination of Ikogosi Warm Spring in South Western Nigeria. *J of Appli Sci* 5 (1): 75-79, 2005

Oladoye, A.O., Aduradola, A.M., Adedire, M.O. and Agboola, D.A. (2014): Composition and stand structure of a regenerating tropical rainforest ecosystem in South-western Nigeria. *International Journal of Biodiversity and Conservation.* 6(11): 765-776.

Osunsina, I.O.O., Ogunjinmi, A.A., Meduna, A.J. and Oyeleke, O.O. (2008). Ecotourism Potentials of Kamuku National Park, Birnin Gwari, Kaduna State. *ASSET Series* 8 (2): 214-224

Pickering, C. and Hill, W. (2007): Impacts of recreation and tourism on plants in protected areas in Australia. CRC for Sustainable Tourism Pty Ltd. pp30.

Reynolds, P.C. and Braithwaite, D. (2001): Towards a conceptual framework for wildlife tourism. *Tourism Manage.,* 22: 31-42. DOI: 10.1016/S0261-5177(00)00018-2.

Rodrigues, R.R. and Leitão Filho, H.F. (2000): Matas ciliares: conservação e recuperação. Edusp/Fapesp, São Paulo.

Wong, P. P. (2002): Tourism as a global driving force for environmental change. In I. Douglas (ed.), Causes and Consequences of Global Environmental Change

(Encyclopedia of Global Environmental Change, vol. 3, pp. 609–23). Chichester: John Wiley.

Wu, J., Huang, J., Han, X., Xie, Z. and Gao, X. (2003): Three Gorges Dam – experiment in habitat fragmentation? *Science* 300:1239-1240.