Ethiopian Journal of Environmental Studies & Management 13(6): 739 – 751, 2020.
ISSN:1998-0507 doi: https://ejesm.org/doi/v13i6.8
Submitted: September 12, 2020 Accepted: November 12, 2020

KNOWLEDGE OF BIRD ECOSYSTEM SERVICES AMONG SECONDARY SCHOOL STUDENTS IN COMMUNITIES AROUND OLD OYO NATIONAL PARK, NIGERIA

***OYEBAMIJI, A.O. AND ODEWUMI, O.S.**
Department of Ecotourism and Wildlife Management, Federal University of Technology Akure, Nigeria
*Correspondence: adeolaoyebamiji@gmail.com

Abstract
Birds act as crucial links in their respective ecologic circle, within and between ecosystems. This study assessed the knowledge of secondary school students in the support zone communities around Old Oyo National Park about the ecosystem services of birds in their environment. Data was collected through questionnaire survey. A total of 345 students from public and private schools in the selected communities surrounding the five ranges of the park were involved in the study. Data were analyzed using one-way ANOVA, T-test and Chi-square. The results revealed that female (54.8%) were more than male (45.2%). Majority of the students ((80.9%)) were in age group >15 years with 19.1% in age 11-14years. None of the students could name all the bird species and their food. Few of the students from both private schools (8.1%) and public schools (3.2%) could correctly name 10-14 birds. Specifically, knowledge of ecosystem services was dependent on ranges (X^2=0.000). The students from both private and public schools and across all the ranges agreed that birds are important in the ecosystem through their services. There was a significant difference in students' knowledge of bird ecosystem services across the ranges (P=0.000). It was concluded that the students' ability to adequately identify common birds in their environment and their food resources is low but they had a good understanding of ecosystem services provided by birds. The study recommended National park should create bird conservation club to encompass bird watching activity among the schools in the surrounding communities.

Key Words: *Ecosystem services, Birds, Students, local communities, National park*

Introduction

Protecting biodiversity and ecosystems is essential for human society, and therefore should be incorporated more directly into public policy, development plans, and daily life (Hackett, 2011) which means we must understand the value of biodiversity for human society. Globally, awareness of our dependence on a variety of ecosystem services (ES) (natural ecological processes that benefit human society) and of their importance and prevalence has progressed toward the goal of making conservation a mainstream value (Sekercioglu, 2010). This has led to a renewed effort to assess the ecological

and economic value of biodiversity and ecosystems (Hocking and Babbitt 2014; Wenny *et al*., 2011).

Higher vertebrates and birds in particular are well-known ecosystem service providers. Birds contribute all four types of ecosystem services through their ecological functions (Sekercioglu, 2006; Whelan *et al*., 2008). Services may arise via bird-products (meat, guano, clothes, etc.), which are classified as provisioning services, or via behavior, mainly foraging behavior (scavenging of carrion and waste, controlling pest populations, pollinating and dispersing plants), which provides regulating services and supporting services (cycling nutrients and contributing to soil formation). Finally, the mere presence of birds provides cultural services (role of birds in art and religion or bird watching/tourism) (Whelan *et al.,* 2008). Through these services, birds have a large, global, but rarely quantified impact on ecosystems.

In all ecosystems birds act as crucial links in their respective ecologic circle, within and between systems (Sekercioglu, 2010). Birds play the role of strong linkers across those systems while serving as movers of energy and materials across various ecosystems. They also help modify, to various scales, each of the system taking the role of makers (Mahendiran and Azeez, 2018). Birds' ecological roles/ecosystem services, are therefore critical to the health of many ecosystems and to human well-being (Whelan *et al*., 2015).

Community knowledge of local birds is important because birds are the most reliable indicators of terrestrial biological richness and environmental conditions. Thus, traditional knowledge is increasingly used by researchers as a source for ideas on ecosystem management, restoration and conservation biology (Huntington, 2000). According to Kideghesho *et al*. (2007); Sarker and Røskaft (2011), the ability of local people to identify bird species may vary with gender, age, tribe and education level. It is possible that the age of the individual and the individual's proximity to protected areas affect that individual's knowledge and understanding of birds. This may have implication for the conservation of more well-known species in the area of concern (Mmassy and Roskaft, 2013). Daily *et al*. (2009) suggested the need for studies that simultaneously measure the magnitude of an ecological function and that of the consequent ecosystem service benefiting humans. This study aimed at providing information on the level of understanding and valuing of bird ecosystem services among secondary school students in the local communities of OONP by assessing their ability to identify common bird species, their food resources as well as their knowledge about the ecological and socio-economic importance of birds. The findings will assist the public and park management, thereby increasing public support for the conservation of birds and their habitats.

Methodology

Study Area

Old Oyo National Park is located between the northern part of Oyo State and southern part of Kwara State. The park occupies 2,512 km^2 of land at latitude 8° 15′ and 9° 00′ N and longitude 3° 35′ and 4° 42′ E at an elevation of 305 – 508 m above sea level (Oladeji *et al*., 2012). It is surrounded by 11 Local Government Areas. The Park derives its name from the ruins of Oyo-Ile (Old Oyo) the ancient political capital of Yoruba Empire. The Park is made up of two previous Native

Administrative Forest Reserves, the Upper Ogun and Oyo-Ile Forest Reserves. These unique ecosystem and historical relics were converted to Game Reserves in 1952 and finally upgraded to the present status of a National Park in 1991. The Park has five ranges; Yemeso, Marguba, Oyo Ile, Sepeteri, and Tede. Nine support zone communities with government and private secondary schools were classified and used for the study based on the ranges adjacent to them as follows: Yemeso range (Ikoyi-Ile), Sepeteri range (Igboho, Igbope), Oyo-Ile range (Igbeti, Ogundiran), Marguba range (Sepeteri, Ago-Amodu) and Tede range (Tede, Ago-Are).

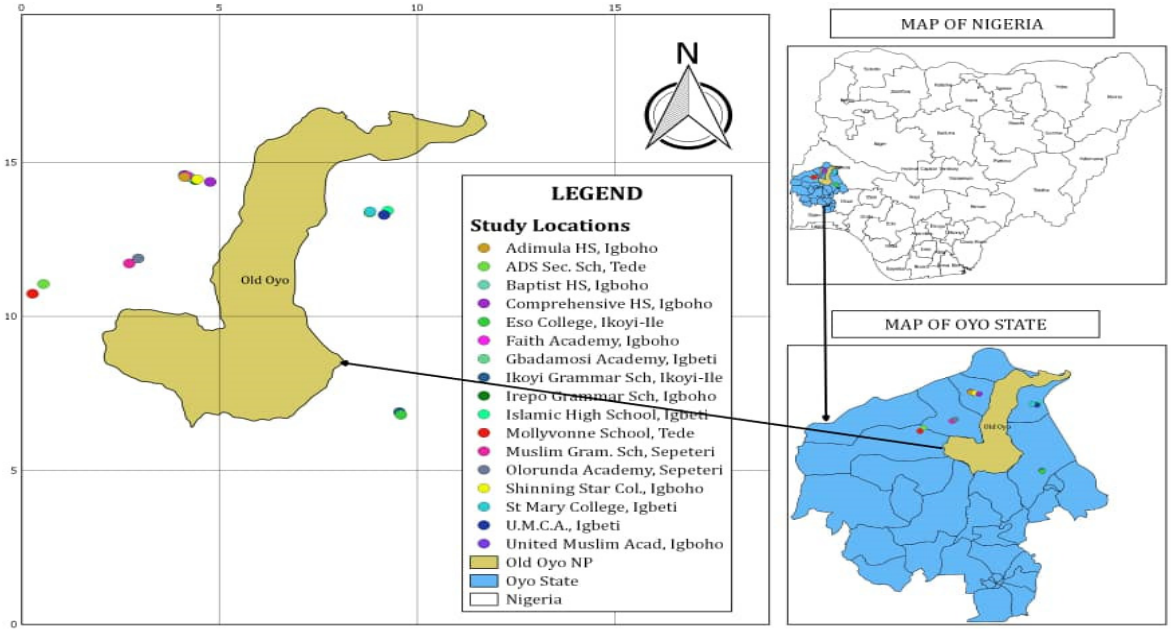

Fig. 1: Map of Old Oyo National Park and schools used in the study

Data Collection

Data for the study was collected through the administration of questionnaire to the students from the selected secondary schools across the five ranges according to (Ogunjinmi *et al*., 2015; Ogunjobi *et al*., 2018). A total of 20 common birds species in the study area. were selected for the study, These include: Yellow billed kite (*Milvus migrans)*, Common kestrel (*Falco tinnunculus)*, Blackwinged kite *(Elanus caeruleus)*, Pied crow *(Corvus albus)*, Hooded vulture (*Necrosyrtes monachus)*, Grey parrot (*Psittacus erithacus)*, Senegal parrot *(Poicephalus senegalus)*, Green turaco *(Tauraco persa)*, Western grey plantain-eater *(Crinifer piscator)*, Senegal coucal *(Centropus senegalensis)*, Ethiopian swallow *(Hirundo aethiopica)*, House martin (*Delichon urbicum)*, Mosque swallow *(Hirundo senegalensis)*, Red eye dove *(Streptopelia semitorquata)*, Laughing dove *(Streptopelia senegalensis)*, African green pigeon *(Treron calvus)*, Common bulbul *(Pycnontus barbatus)*, Grey headed sparrow *(Passer griseus)*, and Village weaver *(Ploceus cucullatus)*.

Questionnaire Administration

A total of 17 (50%) secondary schools out of a total of 34 were selected. The

sample size for the questionnaire was calculated using the Krejcie and Morgan (1970) formula. A total of 345 questionnaires was administered to the respondents from a population size of 3420 students. The Krejcie and Morgan formula was given as;

$$sample\ size\ (s) = \frac{x^2 NP(1-P)}{d^2(N-1) + x^2 P(1-P)}$$

Where:

s= sample size

x^2= 3.84 (chi-square table value at d.f=1)

N= population size

P= population proportion (assumed to be 0.5)

d= degree of accuracy 0.05

The dependent variables was measured using a five-point Likert scale as follows: knowledge of bird ecosystem services were measured as strongly disagree = 1, disagree = 2, undecided = 3, agree = 4, strongly agree = 5. The mean decisions was measured using 1-1.44 = strongly disagree, 1.45-2.44 = disagree, 2.45-3.44 = undecided, 3.45-4.44 = agree and 4.45-5 = strongly agree. The Independent Variables were measured as follows: Gender (male = 1, female = 2), Class (ss1 =1, ss2 = 2 ss3 = 3), Age (11-14 = 1 , >15 =2).

Data Analysis

Data from the administered questionairre were analysed by descriptive (tables and graphs) and inferential statistics using the Statistical Package for Social Science (SPSS) version 21. Chi-square was used to assess the relationships between gender, age, class, communities and the respondents' knowledge of birds' ecosystem services. One-way ANOVA was used to test for significance across the ranges while t-test was used to test for significance between school type.

Results and Discussion

Demographic Statistics

The study showed that there are more females 54.8% than males 45.2%. Majority (80.9%) of the students are aged 15years and above. Also, 64.1% of the students were from public schools with 35.9% from private school. Many of the students (61.4%) were Muslims with few (39.6%) Christian. Majority (82.6%) of the students were indigenes of their respective community while 17.4% were non-indigenes. However, all the respondents were Nigerian (100%) Table 1.

Knowledge of Bird Names and Feeding Materials among students

None of the students from both public and private schools could name all the birds correctly. However, 8.1% of the private school students and 3.2% of the public-school students could correctly name 10-14 birds, 65.3% of the private school students and 43.9% of the public-school students could correctly name 5-9 birds while 26.6% of private school students and 52.9% of public school students could correctly name 1-4 bird names as shown in Figure 2. There was no significant difference (p= 0.26) in the students' knowledge of bird names between private and public schools. Yemoso range had the highest percentage of students (38.1%) that could correctly name 10-14 birds while Marguba range had none. Also, Tede range, had the highest percentage of students (67.6%) that could correctly name 5-9 birds while Marguba range had the least (31.4%) (Figure 3). There was no significant difference (p= 0.06) in the students' knowledge of bird names between schools across the ranges.

In the study, 9.7% of private school students and 5% of public school students

could correctly name the feeding materials of 10-14 birds (Figure 4). However, 63.3% from public schools and 55.6% of the students from the private schools were able to correctly name feeding materials of 1-4 birds. There was no significant difference in the ability of students from both private and public schools to name birds food resources correctly. Also, Yemoso range had the highest percentage of students (61.9%) that could correctly name the feeding materials of 10-14 birds while Sepeteri and Marguba ranges had none (Figure 5). However, Tede range had the highest percentage of students (58.8%) that could correctly name the feeding materials of 5-9 birds while Sepeteri range had the least (27.6%). There was a significant difference ($p = 0.02$) in the ability of students to name food resources of common birds in their area.

The students had fair knowledge of the common bird species and a very low level of knowledge about bird feeding materials, an indication of low level of awareness which is likely to affect their attitude towards bird conservation. This is in tandem with the statement by Clevo and Clem, (2004) that low public knowledge of wildlife inevitably leads to low conservation due to the fact that some wildlife species will be less known than other species. The ability of the students in Tede and Yemoso to perform better in bird identification may be due to their proximity to the park which makes students to be more in touch with their environment thus supporting the study by Mmassy and Roskaft, (2013) that it is possible that the individual's proximity to protected areas affect that individual's knowledge and understanding of birds which may have implication for the conservation of more well-known species in such area.

Table 1: Socio-Demographic Characteristics of the Respondents

	Tede		Sepeteri		Marguba		Oyo-Ile		Yemoso			
Variable	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Total	%
Gender												
Male	13	38.2	10	28.6	78	51.3	42	40.8	13	61.9	156	45.2
Female	21	61.8	25	71.4	74	48.7	61	59.2	8	38.1	189	54.8
Age												
11-14years	8	25.3	4	11.4	27	17.8	13	12.6	14	66.7	66	19.1
15 And Above	26	76.5	31	88.6	125	82.2	90	87.4	7	33.3	279	80.9
School												
Private	14	41.2	5	14.3	50	32.9	45	43.7	10	47.6	124	35.9
Public	20	85.7	30	85.7	102	67.1	58	56.3	11	52.4	221	64.1
Religion												
Christianity	14	41.2	7	20	65	42.8	38	36.9	9	42.9	133	39.6
Islam	20	58.8	28	80	87	57.2	65	63.1	12	57.1	212	61.4

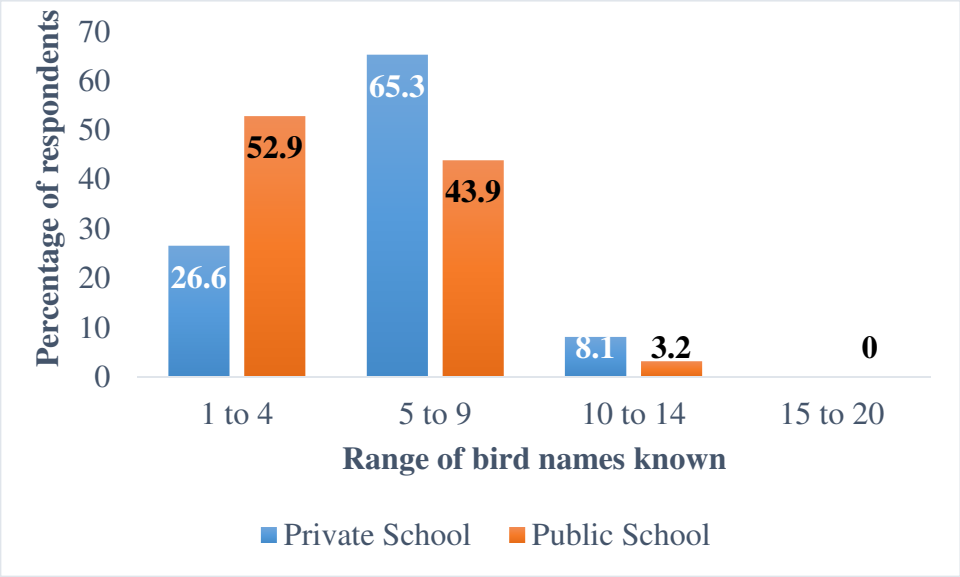

Fig. 2: Knowledge of Bird Names by students in Private and Public Secondary Schools

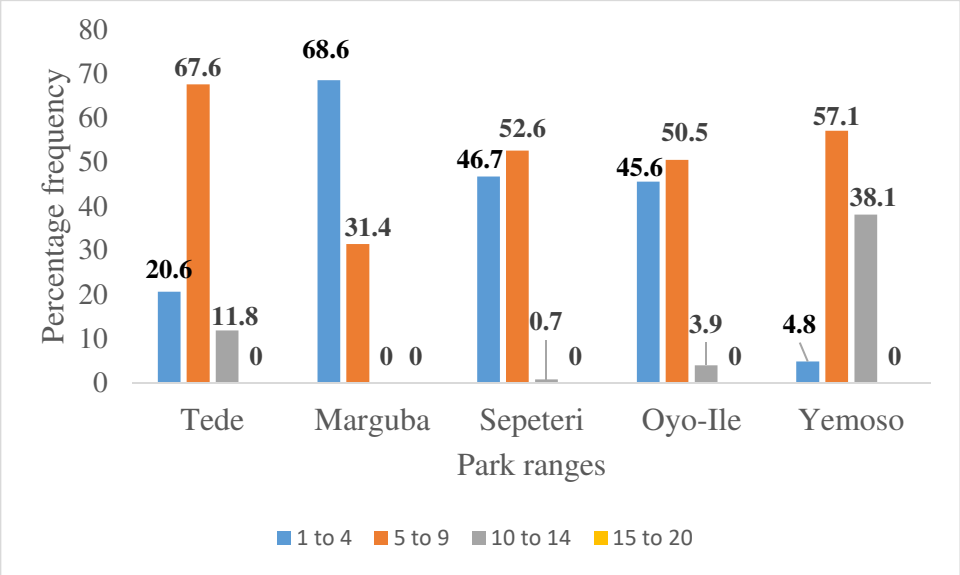

Fig. 3: Knowledge of Bird Names by Students of Secondary Schools across the Ranges

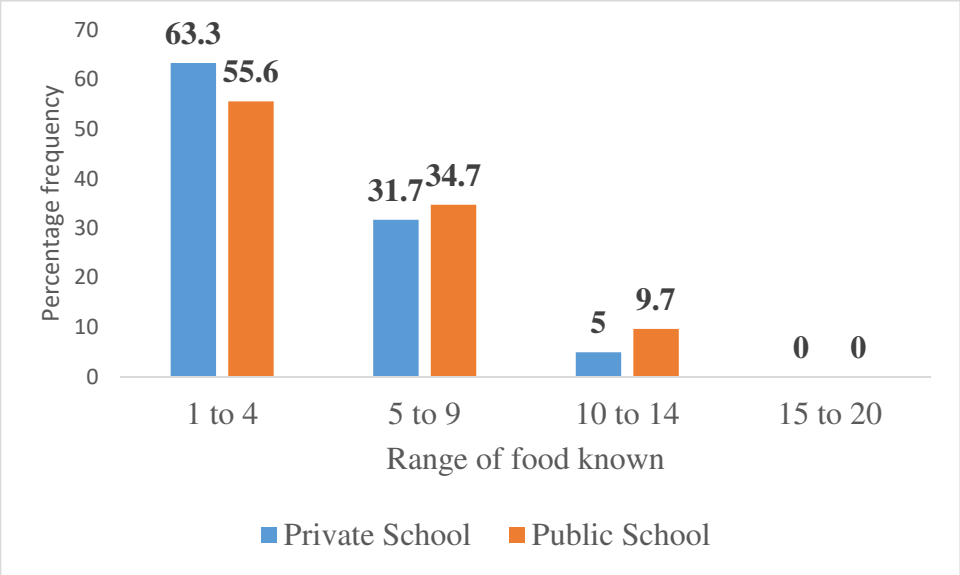

Fig. 4: Range of bird feeding materials known by Private and Public school students

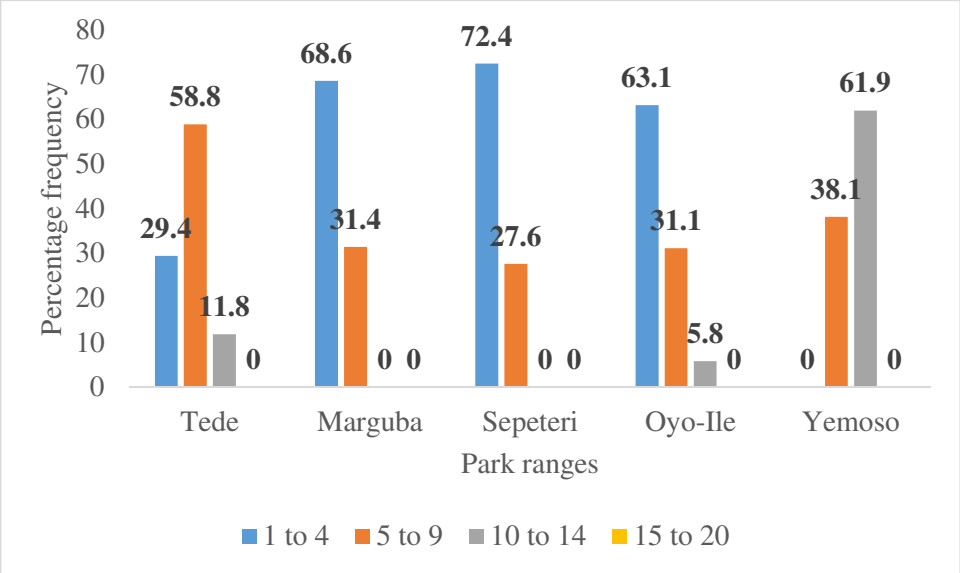

Fig. 5: Ability of Students to Identify Bird Feeding Materials across the Ranges

Knowledge of Ecosystem Services Provided by Birds

The students from both private and public schools as well as schools across the five ranges agreed that birds carry out supporting services such as mixing the soil (4.19 and 4.37), seed dispersal (4.33 and 4.17), droppings fertilise the soil (4.29 and 4.31) and breaking down flora to stimulate new growth (4.19 and 4.00) Table 2. This is in agreement with statements that many bird activities result in shifts in nutrients, such as seasonal migrations across the world releasing nutrients bound in their own bodies in death (González-Bergonzoni *et al*., 2017), through their feces (Bauer and Hoye, 2014), and through, increased vegetation decomposition from trampling (Bird *et al*., 2000). It is also in line with the statement

by Farwig and Berens (2012), García and Martinez (2012); Pejchar *et al*. (2012) that birds are often key agents in seed dispersal, with the potential to move seeds over considerably, driving plant gene flow and population dynamics in undisturbed habitats, as well as vegetation recovery in degraded lands. Overdyck *et al*. (2013) opined that seed dispersal by birds has been found to be a cost-effective alternative to planting seedlings for forest regeneration in urban areas.

The private and public students also agreed with the provisioning services of birds such as food for man and other animals (4.32 and 4.36) and provision of materials for clothing and ornaments (4.04 and 4.02). This is in tandem with the statement by Bennett and Whitten (2003); Moss and Bowers (2007) that in developed countries as well as in many rural areas, many birds are hunted and their eggs are also collected for consumption and sport. Green and Elmberg (2014) also stated that bird feathers provide bedding, insulation, and ornamentation. In yet another way Mahendiran and Azeez, (2018), Craig *et al.* (2012) stated that nesting colonies of birds transfer nutrient across ecosystems annually through birds' guano, an important provisioning service.

The students also agreed that birds function as regulators by feeding on carrion and serving as scavengers (4.07 and 4.01) and help in pest control (4.27 and 4.17). This is validating the statements of Wilson and Wolkovich (2011), that scavenging is key to energy transfer within ecosystems. Gangoso *et al*. (2013) noted that avian scavengers, vultures were estimated to consume 17 – 22% of all putrescible waste within the archipelago of Socotra, off the Horn of Africa. It also supports the assertion of Denny, (2014), Maas *et al*. (2016) that foraging by birds has the potential to provide a critical service in controlling the numbers of agricultural pests, such as insects and rodents.

Both private and public school students agreed that bird serve as cultural significance in rituals and festivals (4.44 and 4.45). Private school students were undecided (3.30) about birds' usefulness as security but public school students agreed that birds are used as security (3.81) (Table 2). This is in tandem with the statement by Carver, (2013); Ma *et al*. (2013); White *et al*. (2014) that birdwatching, globally, represents the primary form of ecotourism, and one of the most popular outdoor recreational activities in the United States and around the world. It has direct economic benefits (an estimated US $40.9 billion was spent in 2011 on birding equipment and bird-trip-related expenditure in the United States) as well as indirect benefits through numerous citizen science programs involving bird-watchers. Schwartz *et al*. (2014) documents positive relationships between human wellbeing and real/perceived bird species richness. On their own Tidemann and Gosler (2010) opined that birds offer a significant focus for studies of cultural services within the ES paradigm, known as the field of ethno-ornithology.

Also, all the respondents from Tede, Sepeteri and Marguba ranges agreed to the statements about supporting, provisioning, regulating and cultural services provided by birds (Table 3). Respondents from Oyo-Ile range were undecided (3.34) about birds' usefulness as security. The respondents from Yemoso range were undecided about birds using seed dispersal to regulate forest growth (3.10) and their usefulness as security (2.76). There is no significant relationship

between level of ecological knowledge and School type (0.506), Gender (0.710), Age (0.077), and Religion (0.819) but it is significant between community (0.000). This contradict the statement of authors like Røskaft *et al*. (2007); Sarker and Røskaft (2011) that the ability of local people to identify bird species and their ecosystem services may vary with gender, age, tribe and education level.

Table 2: Private and Public School Students Knowledge of birds ecosystem services

VARIABLES	PRIVATE		PUBLIC	
	Mean	Standard Deviation	Mean	Standard Deviation
Supporting services				
Birds use their feet to mix the soil	4.19	1.031	4.37	0.818
Birds aids in seed dispersal	4.33	0.773	4.17	0.971
Bird droppings fertilise the soil	4.29	0.901	4.31	1.002
They break down flora to stimulate regrowth	4.19	0.934	4.00	1.170
Mean	4.25	0.91	4.21	0.99
Provisioning services				
They serve as food	4.32	0.933	4.36	0.956
Some parts are used for clothing and ornaments	4.04	1.055	4.02	1.059
Mean	4.18	0.99	4.19	1.01
Regulating services				
Carrion feeders	4.07	1.014	4.01	1.152
Pest control	4.27	0.912	4.17	1.073
Plant pollination	4.33	1.077	4.17	1.052
Mean	4.22	1.44	4.12	1.1
Cultural and Ecotourism services				
Birds are used in rituals and festivals	4.44	0.778	4.45	0.833
Birds are used for security	3.30	1.342	3.81	1.224
They are kept as pets	4.62	0.593	4.51	0.784
Income from bird watching	4.26	1.003	4.24	1.017
Mean	4.16	0.93	4.25	0.96

(Here we use 5-point likert scale: Disagree = 1, Strongly disagree = 2, Neutral = 3, Agree = 4, Strongly agree = 5)

Table 3: Knowledge of birds ecosystem services among secondary school students across the five ranges

Ecosystem Services	Tede Mean/SD	Marguba Mean/SD	Sepeteri Mean/SD	Oyo-Ile Mean/SD	Yemoso Mean/SD	Sig.
Supporting services						
Birds use their feet to mix the soil to spread nutrient	4.35 ±0.917	4.29 ±0.710	4.32 ±0.802	4.16 ±1.118	4.81 ±0.402	
Birds aid in seed dispersal	4.18 ±0.758	4.29 ±0.572	4.39 ±0.738	3.84 ±1.170	4.90 ±0.301	
Birds guano fertilise the soil	4.06 ±1.229	4.43 ±0.655	4.24 ±1.048	4.29 ±0.946	4.95 ±0.218	
Birds help to break down dead plant material	3.85 ±1.105	4.40 ±0.881	3.88 ±1.214	4.17 ±0.964	4.81 ±0.402	
Mean	4.11	4.35	4.21	4.12	4.87	0.00
Provisioning services						
Birds serve as food	4.18 ±1.029	4.43 ±0.655	4.33 ±0.961	4.29 ±1.035	4.90 ±0.301	
Birds feathers are used for clothing and ornaments	3.85 ±1.105	4.09 ±0.853	4.09 ±1.006	3.83 ±1.183	4.76 ±0.539	
Mean	4.02	4.26	4.21	4.06	4.83	0.08
Regulating services						
Birds feed on carrions	4.09 ±1.111	4.17 ±0.785	4.17 ±1.002	3.58 ±1.264	4.90 ±0.301	
Birds control pest (rodents, insects)	3.91 ±1.083	4.34 ±0.639	4.48 ±0.737	3.73 ±1.300	4.81 ±0.402	
Bird pollinate plant	3.97 ±1.058	4.00 ±1.138	4.10 ±0.982	3.82 ±1.027	3.10 ±1.261	
Mean	3.99	4.17	4.25	3.71	4.27	0.00
Cultural and Ecotourism services						
Some birds are used for festivals	4.18 ±1.114	4.31 ±0.718	4.49 ±0.746	4.48 ±0.815	4.62 ±0.805	
Some birds are used as security	3.65 ±1.276	4.11 ±0.900	3.83 ±1.20	3.34 ±1.368	2.76 ±1.480	
Birds are kept as pets	4.32 ±0.912	4.49 ±0.818	4.55 ±0.689	4.58 ±0.707	4.86 ±0.359	
Income from bird watching	4.35 ±0.884	4.09 ±0.853	4.26 ±1.021	4.12 ±1.132	4.81 ±0.402	
Mean	4.13	4.25	4.28	4.13	4.26	0.07

(Here we use 5-point likert scale: Strongly disagree=1, Disagree=2, Neutral=3, Agree=4, Strongly agree=5)

Conclusion and Recommendation

Overall the students' ability to name common birds was within average. However, they had a very good knowledge of the roles birds play in the ecosystem. They are of the opinion that as members of ecosystems, birds play many roles, including as pest devourer, flowers

pollinator, seeds dispersal, carrion scavenger, nutrients cycling, and ecosystem engineers and modify the environment in ways that benefit other species. Birds were also believed to have food, cultural and ecotourism/economic values by the students. Therefore, bird conservation club can be initiated by the park management which should include youths, adults and the teachers in the area in order to enlist students into bird conservation programm.

References

Bauer S, and Hoye B.J. (2014). Migratory animals couple biodiversity and ecosystem functioning worldwide. *Science,* 344 (art. 1242552).

Bennett, J. and S. Whitten. (2003). Duck hunting and wetland conservation: compromise or synergy? *Canad. J. Agric. Econ*. 51: 161–173.

Bird, J.A., Pettygrove, G.S. and Eadie, J.M. (2000). The impact of waterfowl foraging on the decomposition of rice straw: Mutual benefits for rice growers and waterfowl. *Journal of Applied Ecology*, 37: 728–741.

Carver, E. (2013). Birding in the United States: A Demographic and Economic Analysis: Addendum to the 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. US Fish and Wildlife Service Division of Economics.

Clevo, W. and Clem, T. (2004). What role does knowledge of wildlife play in providing support for species' conservation? Working Papers in Economics, Ecology and the Environment. The University of Queensland School of Economics, St Lucia, QLD; p. 10.

Craig, E.C., Elbin, S.B., Danoff-Burg, J.A. and Palmer, M.I. (2012). Impacts of Double- Crested Cormorants (*Phalacrocorax auritus*) and Other Colonial Waterbirds on Plant and Arthropod Communities on Islands in an Urban Estuary. *Waterbirds*, 35: 4-12.

Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Ricketts, T.H., Salzman, J. and Shallenberger, R. (2009). Ecosystem services in decision making: Time to deliver. *Frontiers in Ecology and the Environment*, 7: 21–28.

Denny, M. (2014). Buzz Holling and the functional response. *Bulletin of the Ecological Society of America*, 95: 200–203.

Farwig, N., Berens, D.G. (2012). Imagine a world without seed dispersers: A review of threats, consequences and future directions. *Basic and Applied Ecology*, 13: 109–115.

Gangoso, L., Agudo, R., Anadón, J.D., de la Riva, M., Suleyman, A.S., Porter, R., Donázar, J.A. (2013). Reinventing mutualism between humans and wild fauna: Insights from vultures as ecosystem services providers. *Conservation Letters*, 6: 172–179.

García, D. and Martínez, M. (2012). Species richness matters for the quality of ecosystem services: A test using seed dispersal by frugivorous birds. *Proceedings of the Royal Society*, B 279: 3106–3113.

Green, A.J. and Elmberg, J. (2014). Ecosystem services provided by water birds. *Biol Rev.,* 89: 105–122.

Gonzalez-Bergonzonia, I., Johansend, K. L., Mosbechd, A., Landkildehusb, F., Jeppesenb, E. and Davidson,

T.A. (2017). Small birds, big effects: The Little Auk (*Alle alle*) transforms high arctic ecosystems. In Proceedings of the *Royal Society B: Biological Sciences. February 2017*. DOI: 10.1098/rspb.2016.2572.

Hackett, S.C. (2011). Environmental and natural resource economics: theory, policy, and the sustainable society, 4th edn. M.E, Sharpe Armonk, NY

Hocking, D.J. and Babbitt, K.J. (2014). Amphibian contributions to ecosystem services. Herpetological Conservation and Biology 9:1–17

Huntington, H.P. (2000). Using traditional ecological knowledge in science: methods and applications. *Ecol. Appl*., 10(5): 1270–1274.

Krejcie, R. V. and Morgan, D.W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*. 30, 607-610.

Kronenberg J (2014) Environmental impacts of the use of ecosystem services: case study of birdwatching. *Environ. Manage*., 54: 617–630. doi:10.1007/s00267-014-0317-8

Ma, Z.J, Cheng, Y.X, Wang, J.Y. and Fu, X.H. (2013). The rapid development of birdwatching in mainland China: a new force for bird study and conservation. *Bird Conserv. Int.,* 23: 259–269. doi:10.1017/s0959270912000378

Maas, B., Tscharntke, T., Saleh, S., Putra, D.D. and Clough, Y. (2016). Avian species identity drives predation success in tropical cacao agroforestry. *Journal of Applied Ecology*, 52: 735–743.

Mahendiran, M. and Azeez, P.A. (2018) Ecosystem Services of Birds: A Review of Market and Non-market Values. *Entomol. Ornithol. Herpetol*., 7: 209. doi:10.4172/2161-0983.1000209

Mmassy, E.C. and Røskaft, E. (2013). Knowledge of birds of conservation interest among the people living close to protected areas in Serengeti, Northern Tanzania. *International Journal of Biodiversity Science, Ecosystem Services & Management*. 9(2): 114-122. DOI: 10.1080/21513732.2013.788566

Moss, M.L. and Bowers, P.M. (2007). Migratory bird harvest in northwestern Alaska: a zooarchaeological analysis of Ipiutak and Thule occupations from the Deering archaeological district. *Arctic Anthrop*., 44: 37–50.

Ogunjinmi, A.A., Oluwatuyi, B.G. and Oniya, B.J. (2015). Determining ecological knowledge and attitude of students: The role of personal factors and school exposure. *International Journal of Conservation Science*, 6(3): 427-436.

Ogunjobi, J.A., Owolabi, D.O. and Adejoye, A.F. (2018). Avifauna Identification and Habitat Utilization Knowledge Among Secondary School Students in Okitipupa, Ondo State, Nigeria. *Nig. J. of Wildl. Mgt*., 2(2): 13-20.

Oladeji, S.O., Agbelusi, E.A. and Trevelyan, R. (2012). Anthropogenic activities threatening the Management of the Ecotourism resources in Old Oyo National Park, Nigeria. *Ethopian Journal of Environmental Studies and Management*, 5(1): 100-111.

Overdyck, E., Clarkson, B.D., Laughlin, D.C. and Gemmill, C.E.C. (2013). Testing broadcast seeking methods to restore urban forests in the

presence of seed predators. *Restoration Ecology,* 21: 396–423.

Pejchar, L., Pringle, R.M., Ranganathan, J., Zook, J.R., Duran, G., Oviedo, F. and Daily, G.C. (2012). Birds as agents of seed dispersal in a human dominated landscape in southern Costa Rica. *Biological Conservation,* 141: 536–544.

Røskaft, E., Händel, B., Bjerke, T. and Kaltenborn, B.P. (2007). Human attitudes towards large carnivores in Norway. *Wildl. Biol*., 13(2): 172–185.

Sarker, A.H.M.R. and Røskaft, E. (2010). Human attitudes towards conservation of Asian elephants (*Elephas maximus*) in Bangladesh. *Int. J. Biod. Conserv*., 2(10):316–327.

Sarker, A.H.M.R. and Røskaft, E. (2011). Human attitudes towards the conservation of protected areas: a case study from four protected areas in Bangladesh. *Oryx*. 45(3): 391–400. doi:310.1017/S0030605310001067.

Schwartz, M.W., Brigham, C.A., Hoeksema, J.D., Lyons, K.G., Mills, M.H. and van Mantgem, P.J. (2014). Linking biodiversity to ecosystem function: implications for conservation ecology. *Oecologia*, 122: 297-305.

Sekercioglu, C.H. (2006). Ecological significance of bird populations. In: del Hoyo, J., Elliott, A. and Christie, D. (eds) Handbook of the birds of the world: Old world flycatchers to old world warblers, vol 11. Lynx Edicions, Barcelona, pp 15–51

Sekercioglu, C.H. (2010). Ecosystem functions and services. In: Sodhi NS, Ehrlich PR (eds) Conservation biology for all. Oxford University Press, Oxford, pp 45–72.

Tidemann, S. and Gosler, A.G. (2010). Ethno-ornithology: birds, indigenous peoples. Culture and society, Earthscan, London

Whelan, C.J., Wenny, D.G. and Marquis, R.J (2008). Ecosystem services provided by birds. *Ann N Y Acad Sci.,* 1134:25–60. doi:10.1196/anndis.1439.003

Whelan, C.J., Sekercioglu, C.H. and Wenny, D.G. (2015). Why birds matter: from economic ornithology to ecosystem services. *J Ornithol*.156: Published online 05 May, 2015. DOI 10.1007/s10336-015-1229-y

Wenny, D.G., DeVault, T.L., Johnson, M.D., Kelly, D., Sekercioglu, C.H., Tomback, D.F. and Whelan, C.J. (2011). The need to quantify ecosystem services provided by birds. *Auk.* 128:1–14. doi:10.1525/auk. 2011.10248

Wilson, E.E. and Wolkovich, E.M. (2011). Scavenging: How carnivores and carrion structure communities. *Trends in Ecology and Evolution,* 26: 129–35.

White, E.M., Bowker, J.M., Askew, A.E, Langner, L.L., Arnold, J.R. and English, D.B.K. (2014). Federal outdoor recreation trends: effects on economic opportunities. Working Paper Number 1. US Forest Service National Centre for Natural Resources Economic Research.