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# Biodiversity Conservation Effort and Livelihoods in Parts of Ilaje Riparian Community in Ondo State, Nigeria

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**Abstract**
Biodiversity constitute the resource base of human survival and economic well-being of immediate and future generations. It can be described as the diversity of life forms on Earth, variety of all living things, the places they inhabit, and the ecological interaction between them. This concept has been examined by several scientist and conservationist and with several studies on coastal ecosystem, its biodiversity scenarios, conservation priorities and sustainable livelihood been reported in parts of Niger Delta. However, this study is of high significance hence neither of these studies nor similar research on biodiversity conservation in coastal environment has been carried out in parts of Ilaje in Ondo State. The aim of the study was to evaluate the coastal biodiversity scenarios, livelihood and conservation efforts in Ileja. The gradient – directed transect sampling and Wetland Ecosystem Dynamic Plot (WEDP) method, Participatory Rapid Appraisal (PRA) and direct observational and ground-truthing by hand-held geographic positioning system (GPS - *Garmin Dakota 10 model*) for data collection were adapted. Data analysis was by descriptive analytical tools (frequency count, percentages and charts and levels of response anchors using the Likert –Type scale 7 point level of agreement and 5 point level of agreement). Result of biodiversity awareness of natural resources was high for the fishes; with 84% awareness in Odonla, Molutehin and Odun-Igo respectively; 88% in Ikorigho and 92% in Awoye. The least known resources include: Pig, Mudskipper, and Tortoise respectively with 4% awareness in Odonla, 4% of Snail in Molutehin, and 8% for Cray fish and Periwinkle respectively in Odun-Igo and Awoye. The level of awareness for community protection effort was 24% in Ikorigho and Odun-Igo respectively and 44% in Awoye. Government protection effort (36%) Odonla and (76%) Molutehin. The respondents choice for government effort than traditional effort in flora (mangrove) protection were 88%, 56%, 100%, 84% and 48% in Odonla, Ikorigho, Molutehin, Odun-Igo, and Awoye respectively. Sacred groves recorded 16%, 76% 92% and 68% presence in Ikorigho, Molutehin, Odun-Igo and Awoye respectively. Conclusively, it can be highlighted that the condition of the coastal biodiversity scenarios of Ilaje can be assessed as this may assist the government in executing the legislation at its disposal.
**Keywords:** Ilaje, natural resources, government, tradition, biodiversity
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## INTRODUCTION

The Ilaje coastal landscape in southern parts of Ondo State is incredibly parts of a well-endowed environment with its wetland ecosystems in lower Gulf of Guinea supporting the highest concentration of biodiversity on Earth (UNEP-WCMC, IUCN. 2016). The concept of biological diversity or biodiversity and its connotation in ecological principles and policies for environmental protection has been examined by several scientist and conservationist (Soule and Wilcox, 1980; Wilson, 1988). It entails degree of natures' variety and variability including the number and frequency of genes, species and ecosystems in their totality among living organisms (plant, animals and microorganism) from all ecosystems, and ecological complexes of which they are part of (Soule and Wilcox, 1990). In addition to the ecological interaction that exists in the ecosystem, biodiversity constitute the resource base of human survival and economic well-being of families, communities, nations and future generations. Similarly, it can be described as the diversity of life forms on Earth, variety of all living things, the places they inhabit, and the ecological interaction between them.

The concept of biodiversity may not be overemphasized based on its' trend of chronology ranging from time immemorial when it was commonly christened "natural diversity" over hundreds of millions years by earlier progenitor, to its current application by scientist and conservationist in science and environmental policy.

 

This make our planet fit for the forms of life known today especially in the last decades. The concept of biodiversity comes into full emergence following the declaration and adoption of Agenda 21 at the Convention on Biological Diversity (CBD) during the Earth Summit at Rio de Janeiro, Brazil, in 1992 (McNeely and Scherr, 2001). Biodiversity is among the important feature of major biomes of ecosystems with increasing recognition from the scientific community on Earth. It is a critical component of all natural resources (plant species, animals and microorganisms), the genes they contain and the complex ecosystems they help form and ecological processes which drives all natural systems. It includes diversity within and between species of ecosystems.

Biodiversity is directly responsible for around 40% of the world's economy, particularly in sectors such as agriculture and forestry, and for providing ecosystem services such as clean water and soil fertility. Greater percentage (70%) of the rural poor in the world depends directly on biodiversity for their survival and well-being (CBD, 2010). Biological diversity can be measured in terms of different components (landscapes, ecosystems, communities, species / populations and genes), each of which has structural, compositional and functional attributes (Sandy *et al*., 2001). The ecological complexes in which variety of life forms exist are the intricate and inter dependent relationships that often occur among co-existing organisms, including various processes that are going on continuously in the ecosystem whether terrestrial or aquatic. The diverse interconnected food chains and food webs create an ecological balance in nature. The loss of any one or more species may threaten the existing natural ecological balance and leading to a great potential or direct loss to humans (Ndukwu, 2012) as well as livelihood linkages. Several studies have been carried out and documented on coastal biodiversity for conservation priorities and sustainable livelihood in parts of Niger Delta (John *et al*., 2013; Onwuteaka, 2014; Anthony and Adeleke, 2014; Ajibola *et al*., 2015; Ayansina and Ulrike, 2015; WIA, 2015; John *et al*., 2016).

Similarly, there are many traditional conservation practices of indigenous communities in many parts of the world, which contributed to the conservation and protection of biodiversity. In traditional societies, sustainable natural resource and environmental management is driven by the intimacy between the human communities and behaviours, belief systems and local cultures (Rist *et al*., 2003). A good example of such traditional practices is the conservation and protection of small patches of forest lands by dedicating them to local deities by various indigenous communities of the world, particularly in developing nations such as Nigeria. Such forest patches are called "sacred groves". Furthermore, despite the characteristics and importance of Ilaje coastal biodiversity ecosystem, the area and its ecosystem have been subjected to enormous pressures upon it sustainable livelihood and benefits for several decades. This is through many factors of both anthropogenic and natural intrusions with consequence degradation due to the ecological demand on the ecosystem services of the biosphere. There has been unsystematic exploitation of the resources, coupled with urban infrastructural development, pollution from associated industries, agro-industrial chemicals, and deforestation for local consumption in addition to absence of appropriate legislation. All these constitute the bases and inform the reason for the initiation of this project, to ascertain the conservation effort put forward by the inhabitants of the littoral region as this may go a long way in salvaging the area by preventing further declining and threat to biodiversity scenarios as well as engendering future directions and initiatives for sustainable development planning and restoring biodiversity for conservation priorities, investment and sustainable livelihood.

## 2.0. MATERIALS AND METHODS

### 2.1. Description of study area, location and site:

Ondo State (AKA: Sunshine State) with its' capital in Akure is one of the 36 States of Nigeria; situated between longitudes 4"30" and 6" East of the Greenwich Meridian, 5"45" and 8" 15" North of the Equator (Fig. 2.1). The state lies entirely in the tropics, bounded in the North by Ekiti, Kwara, and Kogi States; in the East by Edo State; in the West by Oyo, Ogun and Osun States; in the and in the South by Delta and the Bight of Benin of the Atlantic Ocean.

The State has an environmental condition of a tropical climate with two distinct seasons (rainy and dry seasons), with maximum temperature annually ranging from 21$^{o}$C to 29$^{o}$C and relatively high humidity due to proximity to the high sea, and maximum rainfall varying from 2000mm in the southern part to 1150mm in the northern area and decreases in amount and distribution from the coast to the hinterland. The vegetation of the area is luxuriant with both heterogeneous and homogenous discrete structural formation and composition.

The State with its' land mass area of 14,788.723 square kilometers comprises 18 Local Council Areas, viz: Akoko North East, Akoko North West, Akoko South East, Akoko South West, Akure North, Akure South, Ese Odo, Idanre, Ifedore, Ile-Oluji/Okeigbo, Irele, Odigbo, Okitipupa, Ondo East, Ondo West, Ose, Owo and **Ilaje - study location (**Fig. 2.2) located in the South Western Zone of Nigeria. The study location -Ilaje (Fig. 2.2) with headquarter located at Igbokoda is a unique area occupying the entire southern part of Ondo state, Nigeria. It is bounded in the south by the Atlantic Ocean, in the west by Ogun State, east by Ese-Odo Local Council Area and Delta State and in the North by Okitipupa Local Council Area of Ondo State. Its coastline covers a distance of 82 Kilometres making it the Local Government area with the longest coastline in Nigeria. Ilaje land has an area not less than 1,318 square kilometres, with associated climatic conditions of maximum rainfall and relative humidity

 

due to proximity to the coastal ecology. Edaphic condition is sandy silt and sandy loam soil complex. The area is characterised by littoral riparian vegetation of fresh and marine ecosystem heterogeneous in nature. The study location is known for its major five Kingdoms: Ugbo, Mahin, Etikan, Aheri and Igbotu consisting of over 100 communities including such sampled sites (Fig. 2.3) as: **Odonla, Ikorigho, Molutehin, Odun-Igo and Awoye.**

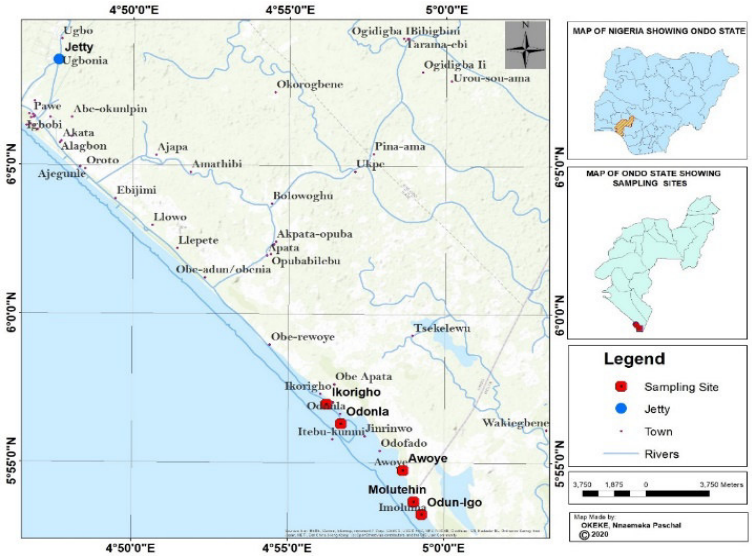


**Fig. 2.1: Map of Nigeria indicating Ondo State (the study areas)**

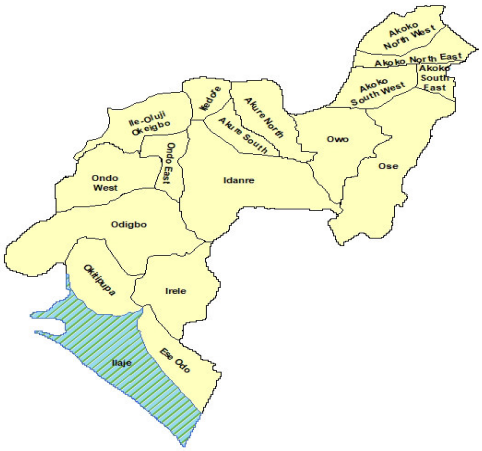


**Fig. 2.2: Ondo State indicating Ilaje – study location**

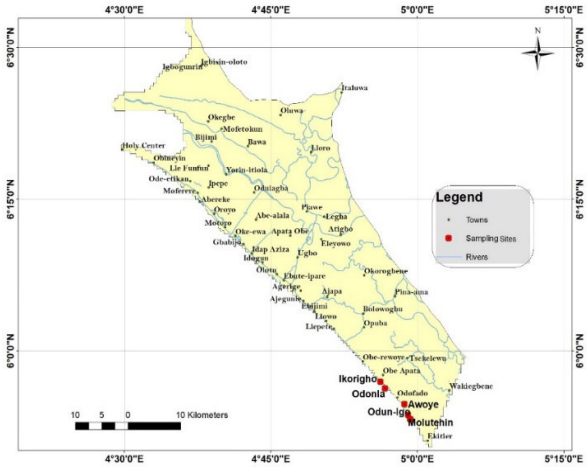


**Fig.2.3: Ilaje –study location indicating sampled sites**

## 2.2. Field Sampling, Data Collection and Analysis

The field assessment for data gathering adopted both primary and secondary sources of information involving descriptive and explorative approach of literature review as primary source; Participatory Rapid Appraisal (PRA) involving a cross sectional data collection by the use of well-structured questionnaires and personal interviews / discussions, focused group discussions, and key informant interviews (Edet *et al*., 2017; Edwin-Wosu and Anaele, 2018) as secondary source. A purposive and random sampling technique was used for selected sampled sites (**Odonla, Ikorigho, Molutehin, Odun-Igo and Awoye**) (Figs.2.4 to 2.8) to administer the questionnaire. Gradient – directed transect sampling and Wetland Ecosystem Dynamic Plot (WEDP) method (Andy, 2004) for assessing: the biodiversity composition based on field direct observational and ground-truthing to acquire information on the livelihood natural resource capital assets and conservation effort of the study area. The ground-truthing was adopted to validate the sampled site using a hand-held Garmin geographic positioning system (GPS - *Garmin Dakota 10 model*) for georeferencing of exact sampled point (Table 2.1) and imagery production of the sampled sites (**Odonla, Ikorigho, Molutehin, Odun-Igo and Awoye)** as exemplified in Figs.2.4 to 2.8. The data generated were subjected to descriptive analytical tools such as: frequency count,

 

percentages and charts as adopted in Edet *et al*. (2017) and levels of response anchors using the Likert –Type scale 7 point level of agreement and 5 point level of agreement (Vagias, 2006) to ascertain the capital assets (natural resources) of the respondents and biodiversity conservation status of the coastal environment at study area.

**Table 2.1: Coordinates of Sampled Site in parts of Ilaje Coastal Ecosystem, Ondo State**

| Latitude (N) | Longitude (E) | Altitude | Community / Sampled site |
|---|---|---|---|
| | | | **Igbokoda** |
| 06º08.543’ | 004º47.618’ | 17ft | Jetty |
| | | | **Odonla** |
| 05º56.407’ | 004º56.768’ | 9 | Jetty |
| 05º56.391’ | 004º56.743’ | 28 | Sampled site |
| 05º56.387’ | 004º56.737’ | 21 | Sampled site |
| | | | **Ikorigho** |
| 05º57.042’ | 004º56.241’ | 27 | Sampled site |
| 05º57.035’ | 004º56.222’ | 43 | Sampled site |
| | | | **Molutehin** |
| 05º53.816’ | 004º59.048’ | 30 | Jetty |
| 05º53.802’ | 004º59.025’ | 15 | Jetty |
| 05º53.782’ | 004º59.034’ | 15 | Jetty |
| 05º53.817’ | 004º59.054’ | 10 | Sampled site |
| 05º53.743’ | 004º59.021’ | 4 | Sampled site |
| 05º53.743’ | 004º59.017’ | 7 | Sampled site |
| 05º53.774’ | 004º59.046’ | -15 | Sampled site |
| | | | **Odun-Igo** |
| 05º53.433’ | 004º59.231’ | 7 | Jetty |
| 05º53.427’ | 004º59.226’ | 13 | Jetty |
| 05º53.404’ | 004º59.237’ | 14 | Jetty |
| 05º53.446’ | 004º59.250’ | 14 | Jetty |
| 05º53.297’ | 004º59.287’ | -1 | Sampled site |
| 05º53.300’ | 004º59.287’ | 4 | Sampled site |
| 05º53.324’ | 004º59.288’ | 15 | Sampled site |
| 05º53.299’ | 004º53.302’ | 24 | Sampled site |
| 05º53.444’ | 004º53.189’ | 59 | Sampled site |
| | | | **Awoye** |
| 05º54.838’ | 004º58.766’ | 9 | Sampled site |
| 05º54.901’ | 004º58.737’ | 4 | Sampled site |
| 05º54.904’ | 004º58.693’ | 12 | Sampled site |

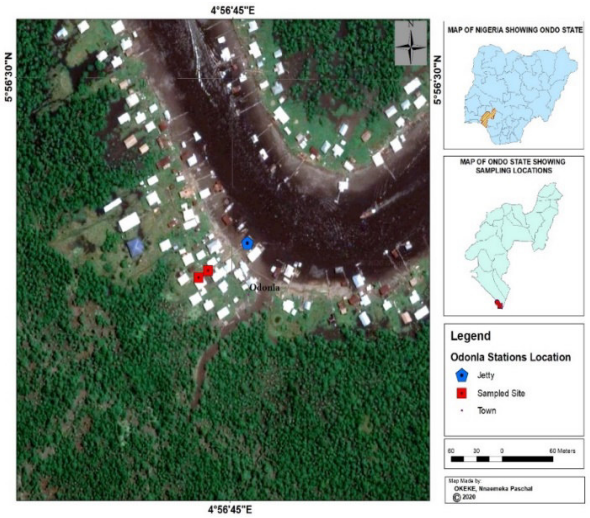


**Fig. 2.4: Imagery of Odonla sampled site at Ilaje study location**

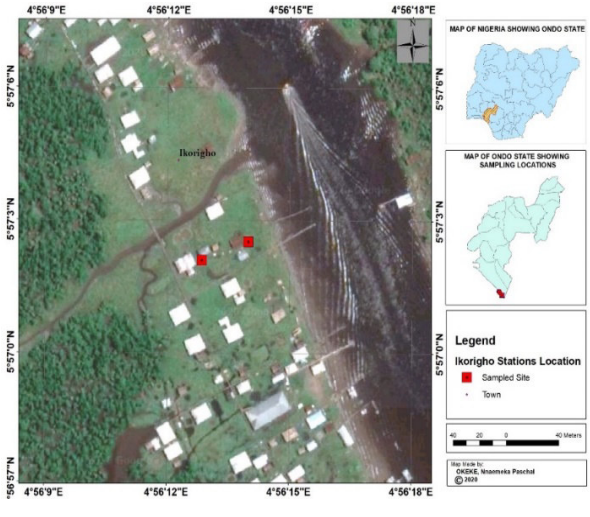


**Fig. 2.5: Imagery of Ikorigho sampled site at Ilaje study location**

 

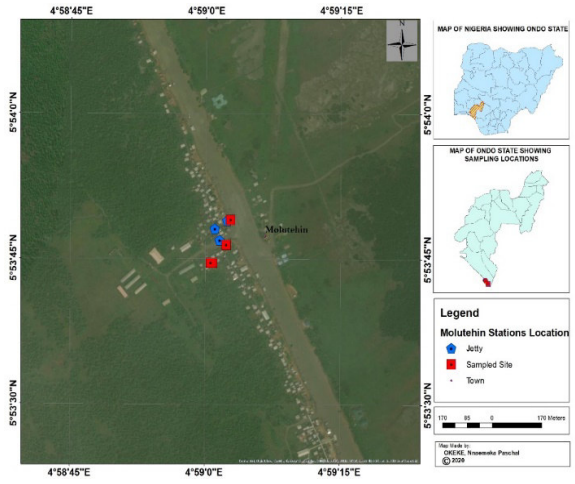


**Fig. 2.6: Imagery of Molutehin sampled site at Ilaje study location**

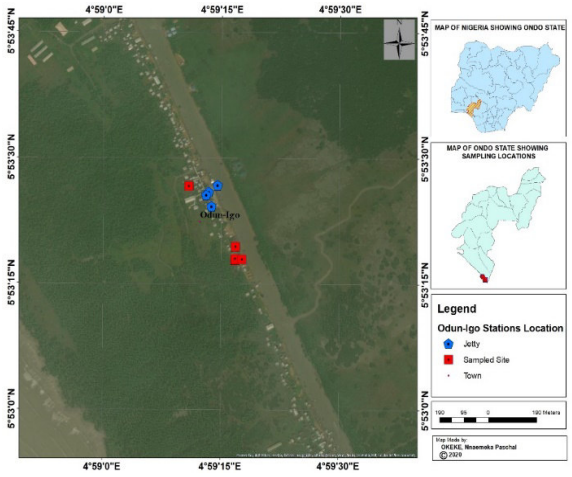


**Fig. 2.7: Imagery of Odun-Igo sampled site at Ilaje study location**

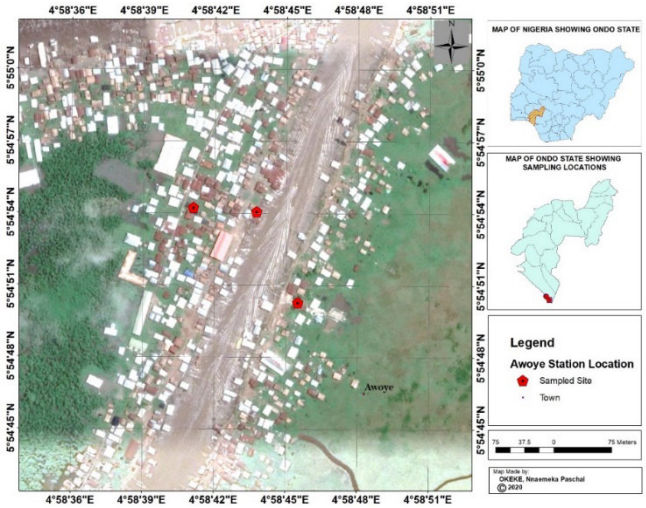


**Fig. 2.8: Imagery of Awoye sampled site at Ilaje study location**

## 3.0. RESULT

The results of the study has enumerated the biodiversity scenarios of conservation priorities in parts of Ilaje coastal ecosystem with the known species of coastal littoral flora (Table 3.1), aquatic faunas (Table 3.2) and patches of sacred groves (Table 3.3) of natural resources. Similarly, the result interpretation of study observation as exemplified in Figs. 3.1.-3.6 of the known natural resources has revealed various trend of conservation efforts with regards to the environmental data based on the known livelihood natural assets in parts of Ilaje coastal communities. Based on the conservation profile the level of awareness of biodiversity resources of sustainable livelihood by the respondents across the community has indicated fishes as a well-known resource capital among other natural resources by the inhabitant with 84% awareness in Odonla, Molutehin and Odun-Igo respectively; 88% in Ikorigho and 92% in Awoye. The least known resources include: Pig, Mudskipper, and Tortoise respectively with 4% awareness in Odonla, 4% for Snail in Molutehin, and 8% for Cray fish and Periwinkle respectively in Odun-Igo and Awoye being recorded in Fig 3.1.The level of awareness by community members versus government for protection effort as represented in Fig. 3.2, has recorded 24% in Ikorigho and Odun-Igo respectively and 44% in Awoye as awareness of community protection effort while 36% and 76% as awareness of government protection effort recorded in Odonla and Molutehin respectively.There was variation in the level of choices by respondents with greater percentage (88%, 56%, 100%, 84% and 48%) of respondence in Odonla, Ikorigho, Molutehin, Odun-Igo, and Awoye respectively (Fig. 3.3) for mangrove protection by government effort as preference to traditional effort in the protection of flora (mangrove) natural resources.Direct support for conservation policy among individuals has recorded a greater level of positive respondence with the following percentages of agreement: 92%, 84% 96% 44% and 72% in Odonla, Ikorigho, Molutehin, Odun-Igo, and Awoye

 

respectively for mangrove conservation. However, with Molutehin and Odun-Igo recording the highest and least support for conservation policy respectively (Fig. 3.4).The presence and absence of conservation area in the communities indicated greater level of absence with 92%, 84%, 80%, 64% and 28% in Odonla, Ikorigho, molutehin, Odun-Igo and Awoye respectively and with few preserve at 4% in Ikorigho and Odun-Igo respectively and 36% in Awoye as exemplified in Fig. 3.5. The assessment of sacred groves (shrine) has shown 16%, 76% 92% and 68% presence in Ikorigho, Molutehin, Odun-Igo and Awoye respectively with 88% and 56% absence in Odonla and Ikorigho respectively (Fig. 3.6).

**Table, 3.1: Representative species of flora biodiversity found in parts of Ilaje coastal ecosystem.**

| S/N | Species | Family | Common Name | Habit |
|---|---|---|---|---|
| 1 | *Rhizophora racemosa* GFW Mey | Rhizophoraceae | Red mangrove | Shrub |
| 2 | *Rhizophora harrizonii* Leechman | Rhizophoraceae | Red mangrove | Shrub |
| 3 | *R. mangles* Linn. | Rhizophoraceae | Red mangrove | Shrub |
| 4 | *Nypa fruticans* Wurmb | Arecaceae | Nipa palm | Shrub |
| 5 | *Avicennia garninans* var. *africana* | Avicenniaceae | White mangrove | Shrub |
| 6 | *Laguncularia racemosa* Gaertn | Combretaceae | Black mangrove | Shrub |
| 7 | *Dalbergia ecastaphyllum* (Linn) Taub | Fabaceae-papi | Coin vine | Shrub |
| 8 | *Machaerum lunatum* (Linn. f) Ducke | Fabaceae | NA | Shrub |
| 9 | *Chrysobalanus icaco* Linn | Chrysobalanaceae | Cocoplum | Shrub |
| 10 | *Acioa barteri* (Hook. f) Engl. | Chrysobalanaceae | NA | |
| 11 | *Syzygium guineense* (Willd) DC | Myrtaceae | NA | Shrub |
| 12 | *Paspalum vaginatum* Sw. | Poaceae | Silt grass | Herb |
| 13 | *Acrostichum aureum* Linn | Adiantaceae | Aquatic fern | Herb |
| 14 | *Conocarpus erectus* Linn | Combretaceae | Green buttonwood | Shrub |
| 15 | *Coccus nucifera* Linn | Areacaceae | Coconut | Tree |
| 16 | *Pandanus leram* Linn. | Pandanaceae | Mat plant | Shrub |
| 17 | *Laccosperma accutiflora* (P. Beauv) O.Ktze. | Arecaceae | Rattan palm | Shrub |
| 18 | *Laccosperma opacum* (Mann & Wendl) Drude | Arecaceae | Rattan palm | Shrub |
| 19 | *Hellea stipulosa* (Dc.) Leroy. | Rubiaceae | False opepe | Tree |
| 20 | *Musa paradisiaca* Linn. | Musaceae | Plantain | Shrub |

**Table, 3.2: Representative of fauna biodiversity found in the parts of Ilaje coastal ecosystem.**

| S/N | Odonla | | Ikorigho | | Molutehin | | Odun-Igo | | Awoye | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Species | Common name | Species | Common name | Species | Common name | Species | Common name | Species | Common name |
| 1 | *Tilapia Sparrmanii* A. Smith | Tilapia | *Silurus anguilaris* Linn. | Catfish | *Bos taurus* Linn | Cow | *Sus barbatus* Muller | Pig | *Chrysichthys nigrodigitatus* | Silver catfish |
| 2 | *Clarias gariepinus* Burchell | Claris | *Ethmalosa fimbriata* Bowdich | Bonga fish | *Ovis arises* Linn | Sheep | *Crocodylus porosus* Laurenti | Crocodile | *Silurus anguilaris* Linn. | Catfish |
| 3 | *Ethmalosa fimbriata* Bowdich | Bonga | *Capra aegagrus hircus* Linn | Goat | *Ethmalosa fimbriata* Bowdich | Bonga fish | *Gallus gallus* Linn | Fowls | *Lutjanus campechanus* | Red snippers |
| 4 | *Helix pomatia* Linn. | Snail | *Canis lupus familiaris* Linn. | Dogs | *Carcharodon carcharias* Linn | Shark | *Cancer pagurus* Linn. | Crab | | Akikoro |
| 5 | *Macaca radiate* E.Geoffrey | Monkey | *Bos Taurus* Linn | Cows | *Tympanotonus fuscatus* var. radula | Periwinkle | *Hippopotamu amphibious* Linn | Hippopotamous | | |
| 6 | *Sus barbatus* Muller | Pig | *Platax sealaris* Hackel | Fresh water fish | *Delphinus delphis* Linn. | Dolphine | *Gorilla gorilla* I.Geoffrey Saint-Hilaire | Gorilla | | |
| 7 | *Periophthalmus barbarus* Linn | Mudskipper | *Tilapia Sparrmanii* A. Smith | Tilapia | *Squalus acanthias* Linn | Dog fish | *Ovis arises* Linn | Sheep | | |
| 8 | *Hippotragus equinus* E.Geoffrey | Antelope | *Macaca radiate* E. Geoffrey | Monkey | *Capra aegagrus hircus* Linn | Goat | *Anas platyrhynchos* Linn. | Duck fowl | | |
| 9 | *Cancer pagurus* Linn. | Crab | *Python bivittatus* Kuhl. | Snake | *Cancer pagurus* Linn. | Crab | | | | |

 

| | | | | | | |
|---|---|---|---|---|---|---|
| **10** | *Silurus anguilaris* Linn. | Catfish | *Alligator mississippi* Cuvier | Alligator | *Bubulcus ibis* | Cattle egret |
| **11** | *Diodon nitchthemerus* G. Cuvier | Spike fish | *Astacus elephas* Fabricius | Cray fish | | |
| **12** | *Fenneropenaeus indicus* H.Milne-Edwards | Prawns | *Sus barbatus* Muller | Pig | | |
| **13** | *Trachinocephalus. Myops* J.R, Forster | Snake fish | *Coregnus hoyi* | White fish (Itoko) | | |
| **14** | *Crocodylus porosus* Laurenti | Crocodile | *Helix pomatia* Linn. | Snail | | |
| **15** | *Littorina littorea* Linn. | Periwinkle | | | | |
| **16** | *Bubalus bubalis* Linn. | Buffalo | | | | |
| **17** | *Testuo graeca* Linn | Tortoise | | | | |
| **18** | *Tyrannula nigricans* Swainson | Bird | | | | |
| **19** | *Pinctada cumingii* Reeve, | Oyster | | | | |
| **20** | **NA** | Bush pig | | | | |
| **21** | *Alligator mississippi* Cuvier | Alligator | | | | |
| **22** | *Heterotist niloticus* G. Cuvier | African bony fish | | | | |
| **23** | *Cinnyris pulchellus* Linn | Sun bird | | | | |
| **24** | *Lutjanus campechanus* | Red sniper | | | | |
| **25** | *Vulpes zerda* Zimmermann | Fox | | | | |
| **26** | *Astacus elephas* Fabricius | Cray fish | | | | |
| **27** | *Sardinella longiceps* Valenciennes | Sardine fish | | | | |
| **28** | *Sciurus carolinensi* Gemelin | Squirrel | | | | |

**Table, 3.3: Patches of Sacred groves in parts of Ilaje study location**

| Odonla | Ikorigho | Molutehin | Odun-Igo | Awoye |
|---|---|---|---|---|
| NIL | Orita | Tighele | Oghwa-Alaiku | Modi |
| | Ayelala | Ajija | Oju-Olokwu | |
| | Ojuolotupa | Sango | Orisa-Aje | |
| | Thunder shine | Ojubo | Olokun | |
| | Oluagbara | | Okiti-Baba | |
| | | | Ojuepepa | |
| | | | Oju-Olokun | |
| | | | Ajija | |
| | | | Oju-Olorun | |
| | | | Aje-Abuku | |
| | | | Oju-Iba | |

 

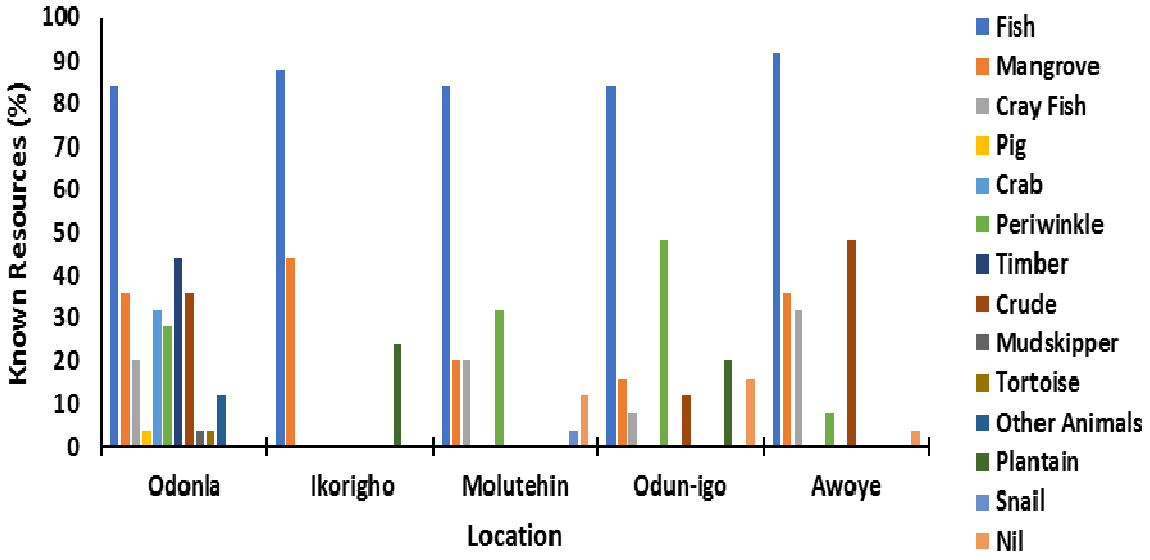


**Fig. 3.1: Biodiversity awareness of Respondents in parts of the sampled Communities in Ilaje study location**

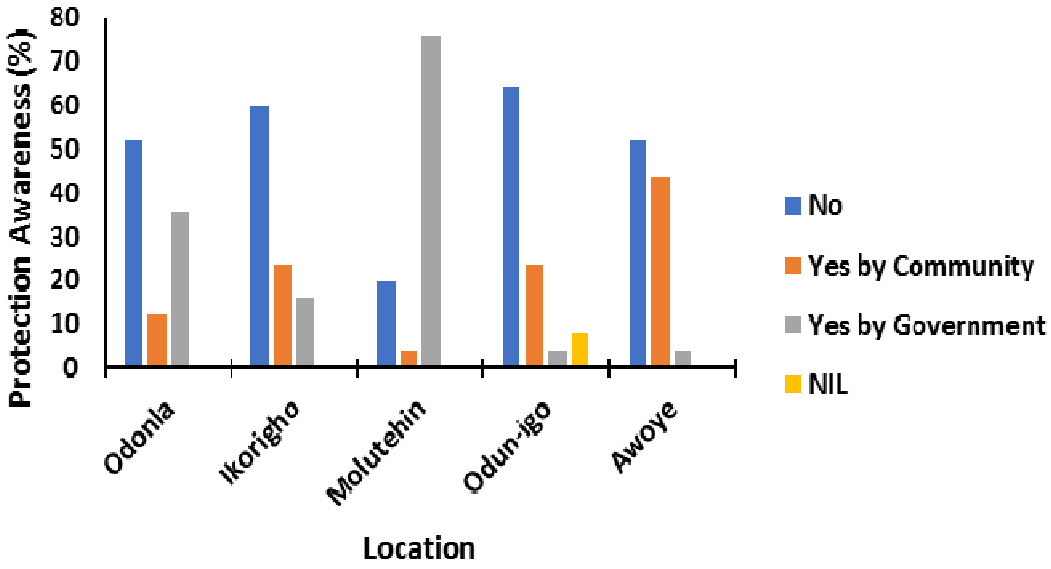


**Fig.3.2: Awareness of Community versus Government protection effort in parts of the sampled Communities in Ilaje study location**

 

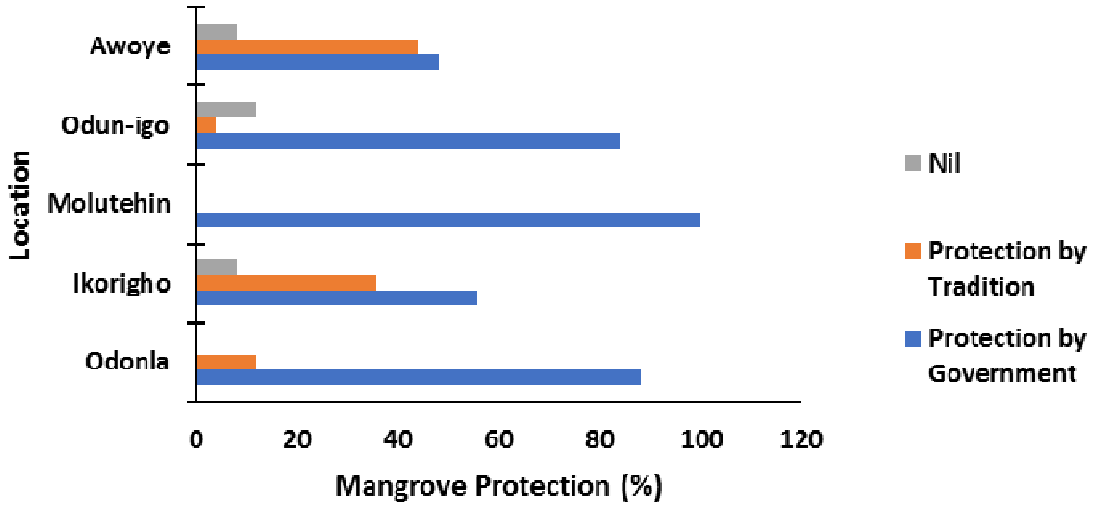


**Fig.3.3: Flora protection effort in parts of the sampled Communities in Ilaje study location**

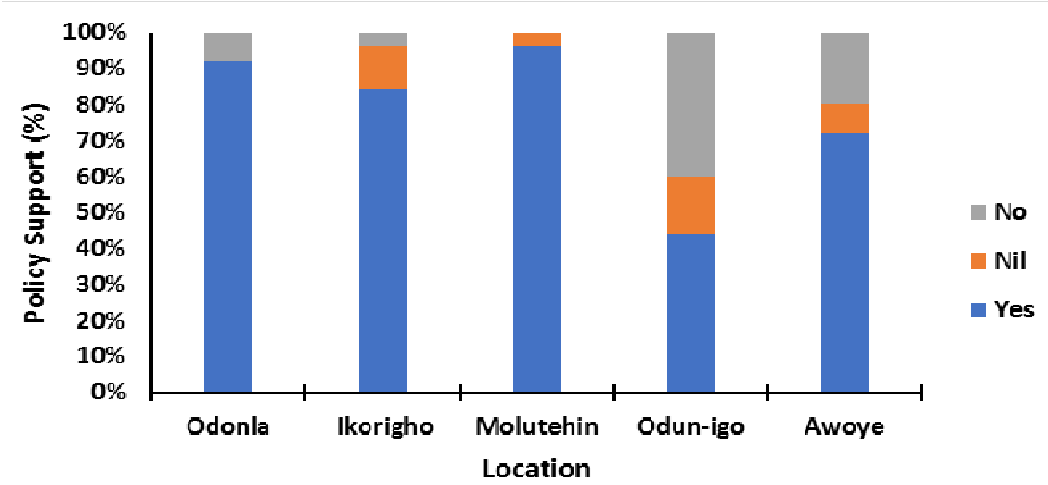


**Fig. 3.4: Community support for conservation policy in parts of the sampled site in Ilaje study location**

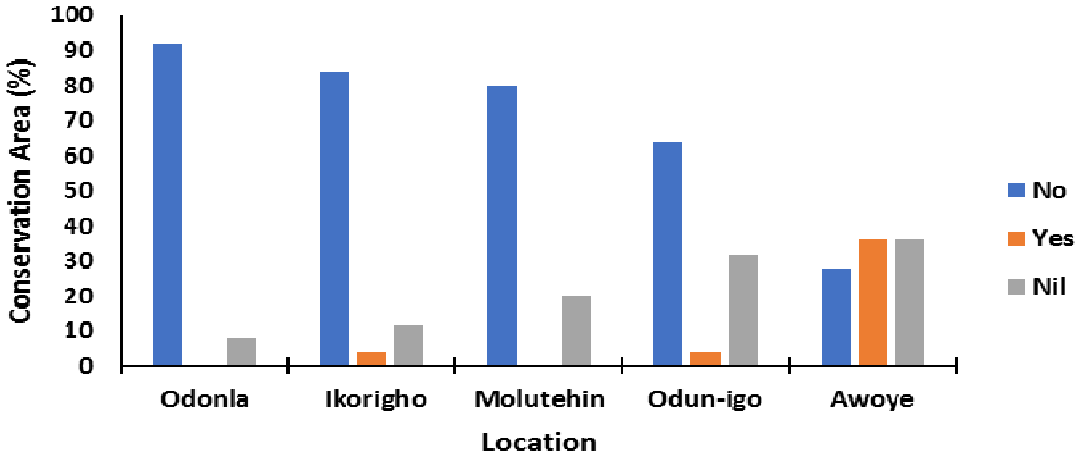


**Fig.3.5: Frequency of Conservation Area in parts of the sampled Communities in Ilaje study location**

 

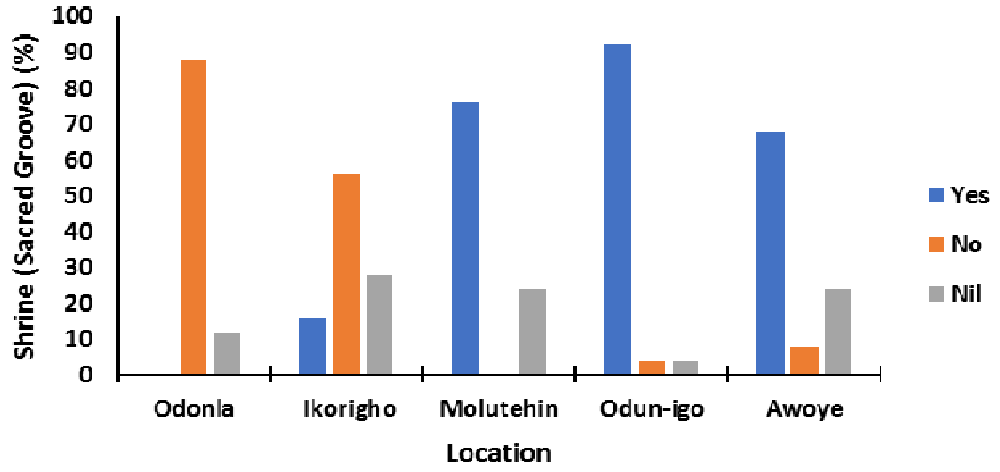


**Fig.3.6: Percentage Composition of Sacred Grove in parts of the sampled Communities in Ilaje study location**

## DISCUSSION

The assessment of the conservation profile of the coastal biodiversity ecosystem has revealed levels of agreement and responses among inhabitants in terms of: biodiversity awareness, protection awareness, flora (mangrove) protected areas, policy support for protected areas, conservation areas and sacred groves. The Ilaje sampled sites were characterized by diverse resources of the coastal ecosystem for the sustainable livelihood of the community members of the study location. Such biodiversity scenarios though at variance have recorded in the community differences in the awareness of biodiversity species of coastal plants and aquatic lives. Furthermore, the major resources known are the aquatic lives of both fresh and marine water fishes among other resources, with the inhabitant of Awoye having the highest level of awareness in biodiversity resources in the order: *Awoye>Ikorigho> Odonla= Molutehin= Odun-Igo.* Similarly the levels of awareness of protected areas were at variance across study communities. Though a greater proportion of inhabitants were not at all aware of any protection effort, the awareness of government and community efforts were respectively noted. The level of awareness based on Likert -5 point scale was in the order: *extremely aware> moderately aware> somewhat aware> slightly aware* correspondingly in *Molutehin> Odonla> Ikorigho> Odun-Igo> Awoye* for government protection awareness and vice-versa in the order: *Awoye> Ikorigho> Odun-Igo> Odonla>Awoye> Molutehin* for community protection awareness. Protected areas (PAs) are fundamental tool to conserve the biodiversity and natural ecosystems of the earth (Rodrigues *et al*., 2004a; Laurance, 2013). They are socio-ecological systems whose management and sustainability heavily influence and are influenced by people (Cumming and Allen, 2017).

Research has been conducted to measure how protected areas (PAs) impact conservation and livelihoods in the regions where they are located (Chao *et al*., 2018). A number of empirical studies have estimated the effects of PAs on poverty alleviation as well as on the livelihoods of local community (Sims, 2010; Foerster *et al*., 2011; Canavire-Bacarreza and Hanauer, 2013; Bennett and Dearden, 2014; Niedziałkowski *et al*., 2014; Heagney *et al*., 2015). For instance, some studies estimate that PAs have reduced poverty in communities in Costa Rica and Thailand (Andam *et al*., 2010; Ferraro and Sim, 2011; Ferraro and Hanauer, 2014). Further with the creation of many PAs, the mandate for PAs in some nations has changed dramatically from protecting biodiversity in the 1980s and 1990s to more recently alleviating poverty and supporting the livelihoods of people (Pfeifer *et al*., 2012).

Because they provide a wide range of valuable ecosystem services for human well-being, there has also been a wide-ranging discussion of the social and economic impacts of PAs (West *et al*., 2006; Pullin *et al*., 2013). In light of the above several government effort have been made toward protected areas; the International Union for Conservation of Nature (IUCN) has developed a set of guidelines that define what constitutes a protected area and categorise PAs with a scheme that includes six management types and four governance types (Dudley, 2008; Day *et al*., 2012). Today, about 15% of the world's land and inland water areas outside of Antarctica, 10% of the coastal and marine areas within national jurisdictions, and 4% of the world's oceans are part of PAs (UNEP-WCMC and IUCN, 2016). Another of such efforts was the project on "Sustainable Management of Protected Areas in East Africa" which was jointly initiated in 2014 by the Chinese Academy of Sciences (CAS), Kenya Wildlife Service (KWS) and United Nations Environment Programme (UN Environment) as part of South-South cooperation, with the aim to identify measures for balanced, sustainable development of conservation and livelihoods (Chao, *et al*., 2018).

 

Based on the statistics from World Data on Protected Area (WDPA), less than 13% of PAs in East Africa adhere to the management category scheme established by IUCN. Instead, East African nation has established 49 categories for PAs, of which "National Park", "Nature Reserve" and "Forest Reserve" are the only designations used by more than three nations. While no governance type has been reported for 425 PAs, 1,610 PAs have been reported under government protection, 74 under indigenous peoples and local communities, 17 under private governance, and 7 under collaborative governance. Research on coastal wetland has identified the need for increased awareness on the use of wetland resources that are neglected or unused because of a lack of indigenous knowledge about their economic value (Thapa and Dahal, 2009). In developing countries, where food security and poverty reduction receive higher priority than environmental protection, wetland conservation is difficult if the local communities do not understand the value of the wetlands (Wood *et al*. 2002). For successful conservation and management, the participating local communities should be fully aware of the importance of wetlands as parts of water cycles, as well as the nature and effects of human impacts (Williams, 2002).

From the study variant levels of respondents choice and preference across communities for government effort in mangrove protection against traditional or community effort was reported. From a socio-ecological system perspective of the present study the level of agreement in order of inhabitants respondence has indicated *Molutehin>Odonla>Odun-Igo>Ikorigho>Awoye* in their choice for government than traditional protection effort. Beside the level of preference for government protection effort report has also indicated some levels of agreement for traditional or community effort in mangrove protection, however, with such effort not agreed among inhabitant in Molutehin community. The need for community participation in the conservation and management of wetland resources is understood globally (Williams, 2002). Several studies have earlier proposed a community-based conservation approach for better wetland resource use and conservation. The implementation of community forest programs, which also incorporate the community-based conservation approach along with many other pro-poor aspects (equal access and equitable resource distribution) in the lake complex, can be a good option because they empower the poor and disadvantaged resource-dependent communities and improve their livelihoods in the long run (Mehta and Heinen 2001, Andrianandrasana *et al*., 2005, Bajracharya *et al*., 2006). It is clear that mangrove conservation has gained substantial momentum, with greater public and Government awareness leading to increased investment and on-the ground action (Daniel *et al*., 2020). Due to vulnerability threatening the status of mangrove and its associated resources it becomes therefore, important to generate awareness among coastal inhabitants regarding beneficial aspect of mangroves and implementation of a proper management strategy to protect these habitats from further destruction.

The support for conservation policy has recorded a greater agreement despite the variation among inhabitants across the study communities in the order: *Molutehin> Odonla> Ikorigho> Awoye> Odun-Igo.* However, there was disagreeing respondence among the inhabitants of the community in the order: *Odun-Igo> Awoye> Odonla> Ikorigho>Molutehin.* Legislation, policies, and programs that accommodate local people in the decision-making process make resource conservation cost-effective and sustainable (Lamsal *et al*., 2015). Important research has been conducted to inform PA managers and policy-makers how to achieve win-win outcomes for ecosystems and human well-being. To assist managers and policy makers, research must: understand the interlinkages between societal, environmental and ecological processes that underpin coupled human-ecosystem interactions (Marchant, and Lane, 2014); and identify and value the mix of economic, social and ecological benefits received by stakeholders from the protected ecosystems (Silvestri *et al*., 2013).

Similar study, has although recorded low participation of local people, majority of them were found to have a positive view of the conservation activities and community-led conservation model of local organizations. The positive attitudes and perceptions are a good indicator that if some conservation initiative is taken, for example, a community-based conservation approach, there is a greater possibility of increased participation of local people in the conservation activities (Lamsal *et al*., 2015). The local community welcomes conservation organizations only if they saw a long-term benefit and local participation. This necessitates conservation organizations to provide pro-community programs so that additional households come forward and lend a hand for the participation and conservation programs. The restriction of local people's access to natural resources that have supported their livelihoods for generations can be good from a conservation point of view only for a short time (Andrade and Rhodes, 2012). Participation of indigenous communities with their traditional knowledge, skills, and practices can help resource conservation while meeting their daily requirements. Andrade and Rhodes (2012) report that the higher the level of community participation, the higher their compliance to the resource conservation; community inclusion is a must for long-term conservation. Islam (2011) investigated community-based water resource management practices in South Asian countries and recommends using community-centered approaches to identify local vulnerabilities and implement appropriate solutions. Community based conservation is a better alternative compared to central level handling of natural resources and is an effective tool in solving conflict and engaging community participation for resource conservation, including wetlands (Trisurat 2006). Community-based conservation approaches have been adopted in a few wetlands of Bangladesh for more than a decade and have been highly successful in securing public participation, benefit sharing and conservation

 

(Thompson and Choudhury 2007). Baral and Heinen (2007) and Diouf (2002) support the view that decentralized participatory conservation programs could help resource-dependent developing countries minimize obstacles between conservation and sustainable development if they are implemented carefully. However, very few researchers have studied ethnic participation in resource conservation and the contributions of wetland resources to human livelihoods. As part of this present study it will assess community participation in coastal resource conservation, and to determine the pattern of coastal resource use and its economic contribution to local ethnic communities residing in parts of Ilaje, Ondo State.

Besides the level of conservation awareness and support policy across communities, the report has indicated a high absence of conservation areas (Protected Areas), despite a non-significant patches of conservation areas observed in just three communities (Ikorigho, Odun-Igo and Awoye) as well as sacred groves across the respective communities. Sacred grove is an ecosystem biome endowed with whole lots of biodiversity, and natural resource potential that needs to be harnessed through its ecosystem services vis-à-vis; Provisioning, Regulating, Cultural and Supporting / habitat services. Biodiversity keeps the ecological processes in a balanced state, which is necessary for human survival. Therefore, the biodiversity-rich sacred groves are of immense ecological significance. Sacred groves play important role in the conservation of flora and fauna. Besides, several rare and threatened species are found only in sacred groves, which are perhaps, the last refuge for these vulnerable species among the ecosystem services. In developing countries, society that depend on the natural resources, including wetlands, come forward for conservation action once they realize the economic value of that ecosystem to their family's subsistence. Their attitudes and perceptions, in many cases, are shaped by the benefits that are seen to accrue from such ecosystem resources (Lamsal *et al*., 2015). Based on the conservation status of the ecosystem the respondence of the inhabitants was in agreement for the protection of conservation areas by both government and traditional efforts which is in tandem with the level of awareness and support policy for protection.

## CONCLUSION

The assessment of the conservation profile of the coastal ecosystem biodiversity has revealed levels of agreement among inhabitants in terms of biodiversity awareness, protection awareness, flora (mangrove) protected areas, policy support for protected areas, conservation areas and sacred groves. The biodiversity scenarios though at variance have recorded in the respective community diverse species of coastal littoral plant, and animals including aquatic faunas and patches of sacred grove. Based on the conservation status of the ecosystem the respondence of the inhabitants was in agreement for the protection of conservation areas by both government and traditional efforts which is in tandem with the level of awareness and support policy for protection. The results obtained shall widen the knowledge on biodiversity scenarios; livelihood and conservation scenarios associated with the interaction between the inhabitant of the area and natural resource capital assets of the environment.

## FUTURE DIRECTIONS AND INITIATIVES

Despite the critical importance of wetlands ecosystem it value chain ecosystem services are disappearing at an alarming rate around the world with a documented loss of at least 35 percent reportedly linked to human development, industrial activity, climate change and aquaculture (Alongi, 2002; Duke *et al*., 2007). This unpleasant reality is generating considerable concern which requires concerted efforts in the following directions:

i. Monitoring of wetland status is a crucial part of effective conservation and management efforts that should entail biotic and abiotic sampling on a local scale and earth observation techniques on a regional scale. It is the only measure to evaluate the degree of ecosystem change.

ii. Conventional vegetation, water and soil sampling for monitoring wetlands is currently very difficult to be carry out in the Niger Delta due to diverse domestic violence. This makes the region unprotected, making sustainable development impossible. Thus, the use of geospatial tools (GPS, GIS and remote sensing) is a suitable and safe approach to measure the extent and character of wetland change in the area over stipulated period.

ii. Wetland degradation in Ilaje and the Niger Delta generally can be stopped by proper implementation of policies and enforcement of the existing environmental laws with more advocacies on national wetland policy necessary.

iii. GIS geo-spatial delineation and implementation of conservation priorities in Ilaje need to be largely conducted to have comprehensive and well synthesized species-specific phytosociology information of the region. This shall improve on any existing record.

iv. Species information including the presence of threatened species is imperative for refining conservation priorities such as the designation of critical habitat, biodiversity hot spot, buffer zone, or marine protected areas.

v. Such comprehensive and systematic species-specific data collation shall inform policies to regulate resource extraction or coastal development.

 

vi. Such data collation shall be used to determine the probability of extinction for all known species of Niger Delta vegetation under the categories and criteria of the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species.

vii. There is need for a comprehensive assessment of the biological and physicochemical oceanography of Ilaje wetland ecosystem amidst the developmental drive in parts of Niger Delta, Nigeria.

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**Conflict of interest**

This paper is devoid of any conflict of interest neither within nor outside the authorship of this paper

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