academicJournals

Vol. 6(1), pp. 25-31, January 2014
DOI: 10.5897/JENE2013.0399
ISSN 2006-9847 ©2014 Academic Journals
http://www.academicjournals.org/JENE

Journal of Ecology and the Natural Environment

Full Length Research Paper

Assessment of water quality of traditionally protected and unprotected rivers, streams and ponds in the Niger Delta, Nigeria

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Accepted 26 November, 2013

Water quality of some traditionally protected water bodies (Obi Pond, Abua Lake, Usede Lake, Atochi Stream and River Ethiope (Source) and unprotected water bodies (Ame-Oghene Pond, Oguta Lake, Omoku Pond, Tenmako Lake and Ikarama Lake) that commonly serve for domestic and drinking purposes in the Niger Delta area of Nigeria have been studied. The purpose of this study was to compare the water quality of traditionally protected water bodies with unprotected water bodies. Water samples collected from the identified sources was experimentally determined using various laboratory methods. Study was carried out within the early rainy season (May to June) of 2013. The water quality of each of the water bodies was assessed using Malaysian water quality index (WQI) and results show that, the water quality of the traditionally protected Obi Pond, Abua Lake, Usede Lake, Atochi Stream and River Ethiope (Source) are 76.73, 76.13, 76.65, 77.04 and 81.25, respectively and belong to class II. Empirically, the water quality can be described as good. The WQI of unprotected Ame-Oghene Pond, Oguta Lake, Tenmako Lake, Ikarama Lake and Omoku Pond are 65.64, 67.46, 37.60, 43.38 and 65.81, respectively. Water quality of Ame-Oghene Pond, Oguta Lake and Omoku Pond belong to Class III and can empirically be described as medium or average while the water quality of Tenmako Lake and Ikarama Lake belong to Class IV and can be empirically described as fair. Using the two-tailed T-test formula to evaluate the null hypotheses, results showed that the calculated t-value was 123.98 while that obtained from the t-Tables at 95% confidence level was 2.31 and hence the null hypotheses was rejected. This means that there is significant difference between the water quality of traditionally protected water bodies and the unprotected water bodies. We are of the view that by incorporating natural sacred sites into the existing protected area networks will improve natural resource conservation.

Key words: Malaysian water quality index, traditionally protected water bodies, unprotected water bodies, sacred groves, gods/spirits, traditional ecological knowledge.

INTRODUCTION

Protected areas are thought to be the cornerstones of biodiversity conservation and the safest strongholds for wildlife (Bruner et al., 2001). Biodiversity species can be protected using the instrument of government and

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traditional beliefs systems. In Nigeria, existing Government protected areas system has two major shortcomings. First, protected areas do not cover certain critical habitats and species because they are often located on land that has no other use. Secondly, is the obvious lack of capacity to implement protection policies. The management of protected areas is often ineffective inpreventing human encroachment. The exclusion of local people is believed to be one of the reasons why protected areas are ineffective, despite the large sums of money and manpower invested in them (Brown, 2003).

The traditional protection of sacred sites, viewed by indigenous people with special social-spiritual context, is found in different ethnic groups throughout the world (Dudley et al., 2006). They occur in various forms and at various spatial scales, such as a single plant species (Colding and Folke, 2001), burial grounds (Wadley and Colfer, 2004), sacred groves (Malhotra, 2001), and even animals or lakes used for religious worship (Rim-Rukeh et al., 2013). Sacred sites have been under the protection of local people for their spiritual value for generations and might be the oldest forms of protected areas in human history (Dudley et al., 2006). It has been shown that the traditional practice of sacred site worship may make significant contributions to protecting endangered species and conserving biodiversity (Bossart et al., 2006), and few studies have documented the social mechanisms behind those traditional practices (Malhotra, 2001).

Traditional ecological knowledge (TEK) has been defined as “a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relation of living beings (including humans) with one another and with their environment” (Berkes et al., 2000). Since the 1980s a growing literature within environmental sciences, ecological anthropology, and resilience theory has stressed the potential role of traditional knowledge for nature conservation and sustainable natural resource management (Toledo, 2002; Turner and Berkes, 2006).

Natural sacred sites, protected by local traditions abound in the Niger Delta area of Nigeria, nevertheless, our knowledge and documentation on the spatial distribution and management of the sacred sites is still poor. In addition, most rural settings in the Niger Delta area major sources of water for drinking and domestic purposes are: rivers/creeks/streams/ponds, hand-dug wells and harvested rain water (FGN, 2000). Studies on the physico-chemical composition of streams and rivers in the study area abound while information on the protection of such water bodies are still scarce and limited. In the study area water bodies that serve the purpose of drinking and domestic activities abound. The objective of the paper therefore is to find out whether or not traditionally protected water bodies have a better quality than unprotected water bodies. The outcome of the study will serve as the starting point for incorporating natural sacred sites into the existing protected area networks and the effectiveness of these networks in achieving conservation objectives could be improved.

MATERIALS AND METHODS

Study area

The study area is the Niger Delta region of Nigeria. It is located within latitude $5°45^1$ to $6°35^1$ and longitude $4°50^1$ to $5°15^1$ in the Southern part of the country. Geopolitically, the Niger Delta comprised of oil producing states: Abia, Akwa-Ibom, Bayelsa, Cross-River, Delta, Edo, Imo, Ondo and Rivers (Figure 1). It covers an estimated area of about 70,000 km^2 which accounts for about 8% of Nigeria’s land mass (Okoko and Nna, 1998). The petroleum Industry in Nigeria is located in the Niger Delta area, with distribution of oil fields. The area accounts for about 90% of Nigeria’s gross earnings as the production and exports of oil and gas play a dominant role in her economy (Okoko and Nna, 1998).

Previous study of the meteorology of the area (Gobo, 1998), reveals the average atmospheric temperature to be 25.50°C in the rainy season and 30.00°C in the dry season. The daily relative humidity values range from 55.50% in dry season to 96.00% in rainy season. Rainfall in the area averages 2500 mm annually. The rainfall pattern shows two identifiable seasons; the rainy season (April to October) and the relatively short dry season (November to March).

The area is a vast flood plain built by accumulation of sedimentary deposits washed down the Niger and Benue rivers. The Niger Delta area is the largest wetland in West Africa and one of the largest mangrove forests in the world (Darafeka, 2003). The area is criss crossed with numerous rivers, streams, tributaries, creeks and creeklets. Human settlement pattern is linear along the bank of the rivers.

Five (5) traditionally protected water bodies (Rivers, streams and lakes) and Five (5) unprotected water bodies (rivers, streams and lakes) that serve as the source of water for domestic and drinking purposes were selected within the study area. All sampling points were geo-referenced (Tables 1 and 2).

Water for the study was sampled according to the method of APHA (1998). At each of the selected water bodies, samples were collected from 5 (five) random points and composited to form a uniform representative sample for that location and taken to the laboratory for analyses. Water samples were collected in plastic containers pre-treated by washing them with 0.1 M dilute hydrochloric acid and sun-dried. At each sample collection point, the plastic containers were first of all rinsed with the water to be collected. One container at a time, with its lid closed was then dipped into the water body to a depth of about 1.0 m and the lid removed to fill the container with water. (The choice of 1.0 m was based (RPI, 1995), on the average depth of water bodies in the study area which is about 4.6 m and the fact that physico-chemical and biological parameters variability at such depths are negligible (Puyate and Rim-rukeh, 2008).

At each of the sample collection sites, a record was kept on the sample container indicating date, time, and location of sampling. Samples were properly handled and all necessary quality assurance and quality control (QA/QC) measures such as preservation, storage, and labeling, were taken. All sample containers were pretreated by washing in dilute hydrochloric acid and rinsed with distilled water. Winklers bottles were used to collect samples for biochemical oxygen demand (BOD) measurements. Fast changing parameters such as pH, temperature, colour, taste, odour, dissolved oxygen (DO), total dissolved solids (TDS), turbidity and electrical conductivity (EC) were measured in-situ using a multi-parameter water quality monitor (model 6000 UPG). At the determination of any of these parameters the instrument was properly checked and

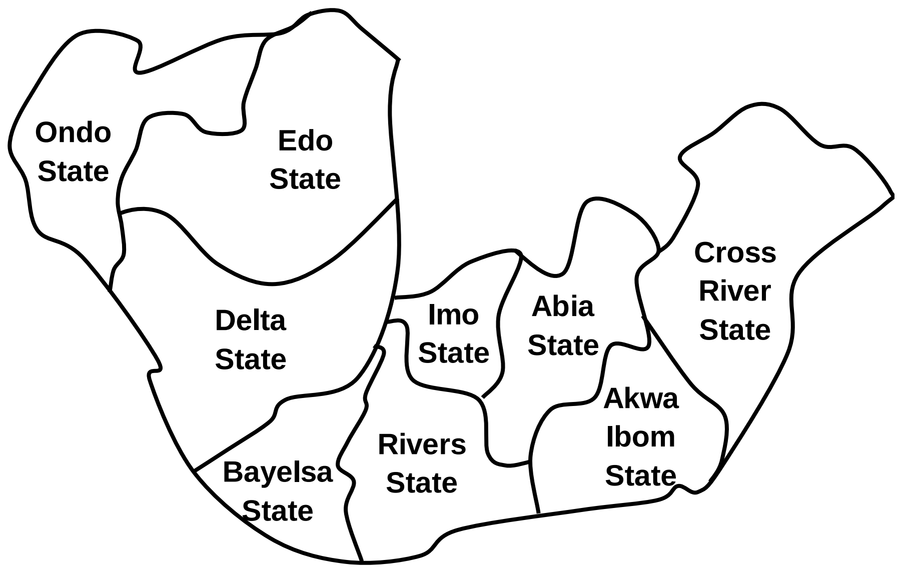

Figure 1. Geopolitical map of the Niger Delta Area.

Table 1. Traditionally protected water bodies in the Niger Delta Area.

Location/Community	Coordinate		Local Government Area/State	Native name of the water body
	Northing	Easting		
Okorobi	195509.06	379922.04	Ethiope East/Delta	Obi Lake
Asaba-Ase	249629.18	416242.11	Ndokwa East/Delta	Usede Pond
Umuaja (Source of River Ethiope)	213671.10	407331.09	Ukwani/Delta	Ethiope River
Ishague	256671.38	437731.73	Aniocha South/Delta	Atochi Stream
Abua	837841.72	478189.55	Abua-Odua/Rivers	Abua Lake

Table 2. Unprotected water bodies in the Niger Delta Area.

Location/Community	Coordinate		Local Government Area/State	Native name of the water body
	Northing	Easting		
Ikarama	143242.16	474506.31	Yenagoa/ Bayelsa	Ikarama Lake
Ovierie -Ovu	195571.16	379929.07	Ethiope East/ Delta	Omoku Pond
Ugheghe	195593.18	379935.02	Ughelli South/ Delta	Ame - Oghene
Oguta	178000.33	470500.12	Oguta/Imo	Oguta Lake
Tenmako	119120.82	388021.02	Southern Ijaw/Bayelsa	Tenmako Lake

calibrated. All water samples for the study were collected within the early rainy season (May to June) of 2013 and taken to Federal University of Petroleum Resources, Department of Environmental Sciences Laboratory for analysis.

In the laboratory, samples were analyzed for: BOD, chemical oxygen demand (COD), suspended solids (SS), ammonical nitrogen (AN), total phosphorus (TP) and total fecal coliform counts (TFCC). TSS was determined using the mass loss technique (APHA 209D - Total Non-filtrate Residual Dried at 103 to 105°C. The oven dried (at 105°C for 1 h) filter paper was used instead of glass fibre filter. The dried filter paper was weighed and then used to filter 100 ml of the sample. The filter paper and the residue were then dried in the oven at 105°C for 1 h and allowed to cool. The paper and residue was then weighed and recorded). BOD was determined using iodometric method while Ammonical Nitrogen was determined using Brucine colourimeter method. Total phosphate (TP) was determined using spectrophotometric method. For fecal coliform samples, 3 dilutions were prepared and analyzed by the membrane filtration method in triplicate. All methods of analyses were consistent with APHA (1998), FMENV (2002) and WHO (1984).

The water quality at each of the sampling location was assessed using the Malaysian Water Quality Index (WQI) as reported (DOE, 2005). Equation 1 gives the water quality index. The index considers six parameters. The parameters which have been chosen are DO, BOD, COD, TSS, pH value (pH), and AN (Khuan et al., 2002). The parameters and the weightage were assigned to each parameter.

The WQI approved by the Malaysian DOE (Equation 1) is calculated based on the above six parameters. Among them DO carries maximum weightage of 0.22 and pH carries the minimum of 0.12 in the WQI equation. The WQI equation eventually consists of the subindexes, which are calculated according to the best-fit relations given in Equations 2 to 7. The formulae used in the calculation of WQI are:

$$WQI = 0.22\ SI_{DO} + 0.19\ SI_{BOD} + 0.16\ SI_{COD} + 0.16\ SI_{TSS} + 0.15\ SI_{AN} + 0.12\ SI_{pH} \quad (1)$$

Where,

WQI = Water quality index (dimensionless unit);
SI_{DO} = Sub-index of DO;
SI_{BOD} = Sub-index of BOD;
SI_{COD} = Sub-index of COD;
SI_{AN} = Sub-index of AN;
SI_{TSS} = Sub-index of TSS;
SIpH = Sub-index of pH.

Sub-index for DO (in % saturation)

SI_{DO} = 0 for DO < 8 (2a)
= 100 for DO > 92 (2b)
= $-0.395 + 0.030DO^2 - 0.00020DO^3$ for 8 < DO < 92 (2c)

Sub-index for BOD

SI_{BOD} = 100.4 - 4.23BOD for BOD < 5 (3a)
= 108e-0.055BOD - 0.1BOD for BOD > 5 (3b)

Sub-index for COD

SI_{COD} = -1.33COD + 99.1 for COD < 20 (4a)
= 103e-0.0157COD - 0.04COD for COD > 20 (4b)

Sub-index for AN

SI_{AN} = 100.5 - 105AN for AN < 0.3 (5a)
= 94e-0.573AN - 5 (AN - 2) for 0.3 < AN < 4 (5b)
= 0 for AN > 4 (5c)

Sub-index for TSS

SI_{TSS} = 97.5e-0.00676SS + 0.05SS for SS < 100 (6a)
= 71e-0.0016SS - 0.015SS for 100 < SS < 1000 (6b)
= 0 for SS > 1000 (6c)

Sub-index for pH

SIpH = $17.2 - 17.2pH + 5.02pH^2$ for pH < 5.5 (7a)
= $-242 + 95.5pH - 6.67pH^2$ for 5.5 < pH < 7 (7b)
= $-181 +82.4pH - 6.05pH^2$ for 7 < pH < 8.75 (7c)
= 536 - 77.0pH + 2.76pH2 for pH > 8.75 (7d)

Based on the Malaysian WQI, water quality is classified according to one of the following categories shown in the Table 3.

Generally, based on Malaysian WQI water quality is classified as follows:

WQI Quality of water

91 - 100 Excellent
71 - 90 Good
51 - 70 Medium or average
26 - 50 Fair
0 - 25 Poor

Statistical analyses

To evaluate whether or not that traditionally protected water bodies has a better quality than unprotected water bodies, null hypotheses (H_o) was formulated and tested using a two-tailed t-test distribution (Equation 8).

The null hypotheses (H_o): There is no significant difference between the water quality of traditionally protected water bodies and unprotected water bodies.

$$T = \frac{X - Y}{\sqrt{\frac{\sigma x^2}{Nx} + \frac{\sigma y^2}{Ny}}} \quad (8)$$

Where,
Nx = Sample size of X
Y = Mean WQI value of unprotected water bodies
X = Mean WQI value of protected water bodies
Ny = Sample size of Y
σy = Standard deviation of y
σx = Standard deviation of x

RESULTS AND DISCUSSION

Results indicating the physico-chemical and biological characteristics of the studied water bodies (traditionally protected and unprotected rivers, streams and ponds) are presented in Table 4.

Results of the assessment of the water quality of the surface water bodies using the water quality index as reported (DOE, 2005) are presented in Table 4. Using the water quality index, the water quality of the traditionally protected Obi Pond, Abua Lake, Usede Lake, Atochi Stream and River Ethiope (Source) are 76.73, 76.13, 76.65, 77.04 and 81.25, respectively and belong to class II. Empirically, the water quality can be described as good.

Using the water quality index, the water quality of unprotected Ame-Oghene Pond, Oguta Lake, Tenmako Lake, Ikarama Lake and Omoku Pond are 65.64, 67.46, 37.60, 43.38 and 65.81, respectively. Water quality of Ame-Oghene Pond, Oguta Lake and Omoku Pond belong to Class III and can empirically be described as medium or average while the water quality of Tenmako Lake and Ikarama Lake belong to Class IV and can be empirically described as fair.

Using the water quality index as reported (DOE, 2005) showed that traditionally protected water bodies have better water quality than unprotected water bodies. However, we are of the view that such observation may have occurred by chance. To test the validity of such findings we statistically tested the outcome using a two-tailed t-test formula (Equation 8). Result showed that the calculated t-value was 123.98 while that obtained from the t-Tables at 95% confidence level was 2.31. Since the calculated t - value was higher than the t-Table value we therefore rejected the null hypotheses. This means that there is significant difference between the water quality of traditionally protected water bodies and the unprotected

Table 3. Classes in Malaysian Water Quality Index (DOE, 2005).

Parameter	Class				
	I	II	III	IV	V
AN	< 0.1	0.1 - 0.3	0.3 - 0.9	0.9 - 2.7	>2.7
BOD	<1	1 - 3	3 -6	6 - 12	>12
COD	<10	10 - 25	25 - 50	50 -100	>100
DO	>7	5 - 7	1 - 5	1 - 3	<1
pH	>7	6 - 7	5 - 6	<5	<5
TSS	<2.5	25 - 50	50 - 150	30 - 50	>300
WQI	>92.7	76.5 - 92.7	51.9 - 76.5	31 - 51.9	<31.0

water bodies.

The good water quality of the traditionally protected water bodies of *Obi* pond, River Ethiope (at the source), Atochi stream, Abua Lake and *Usede* Lake may have stemmed from the role of traditional beliefs in the conservation of natural resources (Berkes et al., 2000; Turner et al., 2000; Shastri et al., 2002). Traditional conservation ethics are capable of protecting biodiversity species in particular and the environment in general as long as the local communities have a stake in it. In fact, traditional ecological knowledge (TEK) systems are infused with practices and concepts, and modes of teaching and learning that can be related directly and indirectly to resource stewardship and conservation at various scales.

At the "*Obi*" pond popularly called *Obi* Lake, it is believed that the Obi spirit inhabits the water body. There is the traditional Obi cult in the community with a juju priest in charge of offering sacrifices to the Obi god. Usually membership into this group is on strict quailfication with terms and condition of membership strictly spelt out and passed down to community members for onward transmission to their children while growing up. Most often the process of initiation is a transitive one, from adolescent to adulthood and done in the night deep inside the shire.

Felling of trees or fuel wood collection within thirty meters radius from the pond is strictly prohibited. This principles though unknown was meant to preserve the watershed and the surrounding vegetation, this consequently checks the amount of evapotranspiration and allows some amount of tolerable water temperature for both micro and aquatic organisms to continue their ecosystem services for the enrichment of the soil, continuous supply of water and the healthy growth of the forest. The vegetation cover also helped to keep the water cool and fresh for drinking. Bathing and washing of clothes around, near or inside the pond is not allowed. Fishing or harvesting any aquatic animals within the pond are not allowed.

Reasons abound for this law, spanning from the respect for the *Obi* god who protect the pond and the organisms helping to purifying the pond and keeping the pond alive and also control the spread of diseases. Silence is observed while fetching water from the pond because it is believed that while speaking, an infected person may spill or splash saliva, so an infected person with tuberculosis or whooping cough for example may spill infected saliva containing the bacteria into the water. In addition this rule ensured the gods were not provoked to anger. Their anger could result in the pond drying up. Other taboos, such as the disallowing of menstruating women to collect water from the pond, prevent the defilement of pond deity and the issue of menstrual blood in traditional beliefs has been treated extensively in anthropology as a source of potent force (McLeod, 1981).

At the source of River Ethiope there is a tree that is believed to have existed over 1000 years. The roots of the tree create an avenue from which the groundwater stored in the aquifer finds its way to the surface from where the water flows to form the River. The tree is regarded as sacred grove and an abode of gods. Spiritual activities at the sacred grove are controlled by chief priest who is in charge of the abode of such god and who also is the messenger of the god in human form. The source of the river is also revered and protected because it is regarded as the source of life and fertility; barren women go to bathe in these waters in the hope of being fertile. The River and their immediate surroundings, especially forest, are protected on the basis that the spirit of the river resided in the area. The responsibility for protecting the grove is vested in the entire community, but a selected group of people or family normally takes the duty to enforce the rules. The conservation strategy, which is one of preservation, is enshrined in taboos, totems and sacrileges and other numerous cultural and religious rites and is maintained through reverence for the gods and ancestral spirits. These traditional guards regularly patrol the periphery of the grove and arrest intruders, who are reported to the chief priest for the necessary customary sanctions. The sanctions, which are done for the purpose of pacifying and purifying the gods and spirits, vary depending on the gravity of the offense. However, they usually consist of a cash fine, bottles of hot drinks, goats, sheep, chicken, kola nuts and alligator pepper as sacrifice to the gods.

Action that attracts the wraths of the god includes (i) felling of trees or fuel wood collection within twenty meters radius from the area is strictly prohibited. This principles though unknown was meant to preserve the watershed

Table 4. Physico-chemical and biological characteristics of studied water bodies in the Niger Delta Area, Nigeria.

Parameter	Surface water bodies										FMENV Regulatory for drinking water (1995)
	Traditionally protected water bodies					Unprotected water bodies					
	Obi Lake	Abua Lake	Usede Pond	Atochi Stream	Ethiope River (Source)	Ame-Oghene Pond	Oguta Lake	Tenmako Lake	Ikarama Lake	Omoku Pond	
Colour (TCU)	16.0	14.0	12.0	3.0	2.0	13.0	11.0	17.0	16.0	10.0	-
Taste	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Objectionable	Objectionable	Unobjectionable	Unobjectionable
Odour	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Unobjectionable	Objectionable	Objectionable	Unobjectionable	Unobjectionable
pH	7.4	7.1	7.1	6.9	6.9	7.2	6.8	5.1	5.9	6.6	6.5 - 8.5
Temperature (°C)	26.4	27.7	26.8	26.5	25.8	26.9	31.0	28.1	29.7	28.3	25 -30
Turbidity(NTU)	12.6	14.3	14.7	2.7	3.1	10.3	10.8	21.6	18.0	11.70	5.0
Electrical Conductivity (µS/cm)	14.7	15.4	11.3	23.7	6.80	11.7	16.5	21.4	24.8	13.5	-
DO (mg/L)	8.7	7.2	8.3	8.9	9.1	7.4	7.5	2.7	4.70	5.5	>7.5
COD (mg/L)	1.90	2.3	2.1	1.30	0.97	1.48	2.1	21.5	15.3	6.6	-
BOD (mg/L)	1.10	1.60	1.00	0.98	0.60	1.32	1.40	17.3	10.7	1.90	-
TDS (mg/L)	57.3	47.6	61.8	12.8	8.50	13.4	37.4	184.0	63.7	33.8	2000
SS (mg/L)	9.70	24.6	10.3	8.60	5.50	9.30	13.3	37.3	23.7	21.1	50
Total Phosphate (mg/L)	0.73	1.86	0.86	0.33	0.177	2.40	0.08	2.47	1.66	1.61	-
Ammonical nitrogen (mg/L)	0.018	1.01	0.021	0.031	0.011	0.034	0.8	4.70	1.17	0.93	-
Total Feacal coliforms (cfu/mL)	Nil	Nil	Nil	Nil	Nil	Nil	Nil	2,175	750	230	Nil
WQI	76.73	76.13	76.65	77.04	81.25	65.64	67.46	37.60	43.38	65.81	

and the surrounding vegetation, this consequently checks the amount of evapotranspiration and allows some amount of tolerable water temperature for both micro and aquatic organisms to continue their ecosystem services for the enrichment of the soil, continuous supply of water and the healthy growth of the forest. The vegetation cover also helped to keep the water cool and fresh for drinking. This system protects the watershed from destruction. (ii) Bathing and washing of clothes around, near or inside the source of the River where drinking water is fetched was not allowed. (iii) Fishing or harvesting any aquatic animals within the source of the River is not allowed.

"*Usede"* pond is a mysterious pond harvested for fish species by the entire Ase kingdom once in ten years. The *Usede* pond is such that nobody goes there to fish alone within this period of ten years. Even if you go fishing alone, the punishment begins by having a bloated stomach and later death no matter the sacrifice made. So entrant into the pond alone is frightening. The reverence for the water body is due to presence of a god in the form a big fish with a string of cowry that have sighted during the fishing activities. The appearance of the big fish with a string of cowry signifies the end of the fishing festival and everybody inside the pond must be called out of the pond.

At Atochi stream by Ughelli - Asaba Road is regarded as sacred grove and an abode of the *mami -water goddess*. Spiritual activities at the sacred grove are controlled by chief priest who is in charge of the abode of such god and who also the messenger of the god in human form. The point is revered and protected because it is regarded as the fountain of life known for its potency to battle spirits of witches and wizards and the breaking of ancestral curses. The immediate surroundings, especially forest, are protected on the basis that the spirit of the stream resided in the area. The responsibility for protecting the grove is vested in the chief priest who is usually a woman. Although there are no reported actions against any one that defile the area, the water is revered because of its reported potency.

At Abua community is a mysterious pond (Abua Lake) harvested for fish species by the entire community once in seven years. The Abua Lake is such that nobody goes there to fish alone within this period of seven years. Even if you go fishing alone, the punishment begins by having a bloated stomach and later death no matter the sacrifice made. So entrant into the pond alone is frightening. The reverence for the water body because of the presence water goddess prevents community people from using the water resource indiscriminately.

Conclusion

Here, we presented evidence of nature conservation through traditional belief systems from across the Niger Delta area of Nigeria drawing from the experience of traditionally protected water bodies and unprotected water bodies. Traditionally protected ecosystems can play a valuable role in natural resource conservation especially water bodies (rivers, streams, lakes and ponds) because of the local people's willingness to protect and conserve them. We are of the view that by incorporating natural sacred sites into the existing protected area networks, the effectiveness of these networks in achieving conservation objectives could be improved, by increasing the variety of protected habitats and by harnessing the support of local people.

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