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*Research Paper*

**EXPLORATORY ACCOUNT OF THE COMMUNITY STRUCTURE OF SEA TURTLES IN THREE COASTLINE SECTORS OF DELTA STATE, NIGERIA**

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**Abstract**

We explored the community structure of sea turtles in three coastline sectors of Delta State, Nigeria for a period of 22 months (November 2019 to August 2021). Six sites were sampled per river system. Three sea turtle species were recorded in course of the study namely *Dermochelys coriacea* (leather back turtle), *Chelonia mydas* (green turtle) and *Lepidochelys olivacea* (olive ridley turtle). *Lepidochelys olivacea* was the most preponderant with a total of 25 individuals (59.52) either sighted or captured in the course of the study followed by *Dermochelys coriacea* and *Chelonia mydas*, followed by *Dermochelys coriacea* with 14 (33.33%) individuals and *Chelonia mydas* was the least represented (3; 7.14%). Adult sea turtles were represented in the six sites sampled. Juvenile sea turtles were only present in SW5 and SW6. Hatching sea turtles were only present in SW1 and SW5. The highest frequency distribution of hatching sea turtles was in SW1, followed by SW5. No hatching sea turtles in the remaining four sites. The dendrogram constructed based on Bray-Curtis similarity index showed the sea turtles were more similar between SW 5 and SW 6. We recommend that more coastlines in Delta State and Nigeria should be explored, most especially coastline harboring oil exploration facilities to ascertain the conservation status of sea turtles and other aquatic biodiversity.

Key words: *Community structure, sea turtles, Lepidochelys olivacea (Olive Ridley), conservation, Delta State, Nigeria.*

**INTRODUCTION**

West Africa has been revealed to be one of the major source points for trading of illegal wildlife and the products of the wildlife among the sub regions of Africa [1]. Nigeria as a nation has series of regulations and laws guiding both terrestrial and aquatic ecosystems, but they are weakly or unenforced [2]. Human activities such as bush burning, fuel wood harvesting, deforestation and oil pollution are major factors deteriorating the environment in Nigeria [3]. The worst hit environment is the aquatic

environment, coastal waters inclusive, as the catchments of most of the coastal waters most especially in the Niger Delta region of Nigeria harbours numerous fishery and rich minerals resources, as well as oil and gas reserves [4-5].

The Niger Delta region of Nigeria is a well-known biodiversity hotspot with one of the largest wetland area in the coast of West Africa [6-7]. Due to this importance of the region, there have been increased pressures on the region such as natural habitat loss occasioned by rural-urban migration, overpopulation and serious industrial activities by various oil exploration outlets [8-9]. The region risk serious ecological imbalance owing to the increased pressures from oil exploration and other associated human pressures [10]. Ecological imbalance has debilitating effects on environmental variables as well as the flora and fauna within the environment [11]. Shift in ecological balance occasioned by pollution also results in shift in environmental variables (e.g. heavy metals, conductivity, biochemical oxygen demand and nutrients) [12-13].

Increasing level of the aforementioned variables leads to reduction or loss of flora and fauna in the environment, most especially in water bodies (the Niger Delta coastline not excluded). The catchments of the Niger Delta coastal stretch consists of the well-known plants (e.g. mangrove plants) that are of economic importance such as species of *Rhizophora*; *Rhizophora racemosa* (tall red mangrove), *Rhizophora mangle* (short red mangrove) and *Rhizophora harrisonii* (short red mangrove) and one species of white mangrove, *Avicennia germinans* and black mangrove, *Laguncularia racemosa* [14]. No doubt the diversity and abundance of these mangrove plants are gradually eroding due to the increased pressures on the coastal stretch of the Niger Delta. The fauna of the Niger Delta region is not exempted from the imminent dangers posed by human pressures. For instance, Izah *et al.* [3] explored the factors affecting the population trend of biodiversity in the Niger Delta region of Nigeria. They explained that the biodiversity resources of the Niger Delta comprises of several species of mammals, reptiles, amphibians, avian fauna, microorganisms, fisheries (e.g. fish species and sea turtles). The sea turtles represent the least explored fauna in the coastal stretch of Nigeria compared the wide to exploratory studies conducted on sea turtles in other parts of the world including the West Atlantic coasts and the Caribbean island [15]. Studies on sea turtles in Africa date back to later part of 1950 [16], and it is only recently studies on sea turtles in the Gulf of Guinea and the West Africa coasts begun [17]. In Nigerian coastal waters (i.e., Bights of Benin and Bonny), five out of eight species of sea turtles of the world have been reported to occur [18-19]. They include *Chelonia mydas* (Atlantic green turtle), *Lepidochelys olivacea* (Olive Ridley turtle), *Eretmochelys imbricata* (Atlantic Hawksbill turtle), *Caretta caretta* (Atlantic Loggerhead turtle) and *Dermochelys coriacea* (Leatherback turtle) [20-21]. Despite the establishment of sea turtle research by WASTCON, little or nothing is known about the ecology, abundance, diversity and distribution patterns as well as the conservation status of these species in Nigeria most especially in the Niger Delta coastlines [21]. Therefore, the present study we explored the composition and abundance of sea turtles along the coastline of Delta State, Niger Delta region of Nigeria.

## **MATERIALS AND METHODS**

### **Study area**

The study area is located along the coastline of Delta State within the Niger Delta region of Nigeria. The Niger Delta region occupies an approximate area of 70,000 km<sup>2</sup> and it is located at the southern tip of Nigeria [8]. The area is characterised by mangrove swamps, wetlands, inland waters, brackish waters, vegetation, and an extensive tropical rain forest [7].

### **Climate of the study area**

The climate of Delta State, Niger Delta region is a tropical characterised by two seasons (dry and wet seasons [2, 8]. The dry season is shorter than the wet season and it spans from October to February while the wet season of the area is characterised by extensive and intensive rainfall which spans from March to September. The average annual temperature is 28°C, with average annual rainfall of between 2000 mm and 3500 mm [2, 7].

### **Vegetation of the study area**

Riparian vegetation within the three riverine systems sampled consists of *Avicinia* spp., *Bambusa* spp., *Elaeis guineensis*, *Pandanus* spp., *Mitragyna ciliata*, *Nymphaea* spp., *Panicum repens*, *Pistia stratiotes*, and *Musanga* sp., *Musa* sp., while shrubs include *Acrosticum aureum*, *Ficus* spp., *Alchornea* spp. [8, 22]. *Rhizophora* spp. and *Avicenna* spp. are examples of mangrove trees within the sampled rivers [9].

### **Sampled sites**

For the purpose of this study, two sites each were marked out from three riverine systems namely: Benin (SW1, SW2) Escravos (SW3, SW4) and Forcados (SW5, SW6) Rivers. Sampling was conducted for a period of 22 months (November 2019 to August 2021).

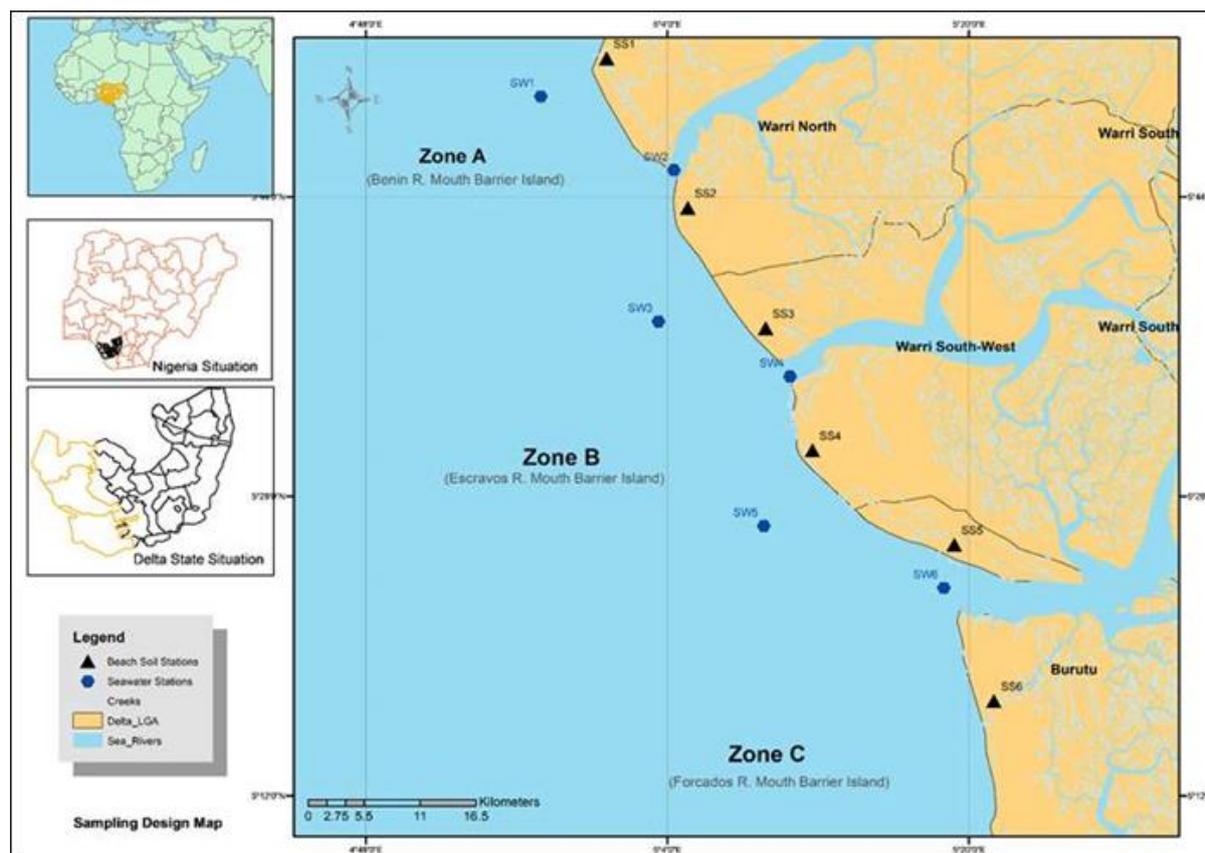


Figure 1: Map showing the sampled sites within the coastline of Delta State, Nigeria

### Sea turtle sampling techniques

Sea turtles were sampled following established procedures [17, 21, 23-24]:

- i. Observation of by-catches from fishermen boats. During monthly sampling trips, the field team were stationed at fish landing jetties to observe fishermen boats and their catches for possible by-catches of sea turtles.
- ii. Visual sightings on-board Small Fibre Boats and on-board Larger Survey Vessels using Binoculars and Underwater Cameras were also employed in recording sea turtle individuals during the study period. During monthly field sampling we also ventured out to the River mouths and within 1km into the sea for opportunistic sightings if possible.
- iii. Investigation of local trophies and remains. Scouting renowned fishermen houses of each river mouth villages of Forcados, Escravos and Benin Rivers revealed some sea turtle trophies such as carapaces, skulls and other remains of turtle species caught for local consumption, medicine and cultural values in the past.

### Identification of Sea turtles

Sea turtles were identified using field identification key by Pritchard and Mortimer [25]. Available literatures were also consulted for sea turtles identification [14, 21, 26]. Pictures of encountered sea turtles were also sent to experts at the Nigeria Institutes for Oceanography and Marine Research, Port Harcourt and Lagos stations for confirmation of sea turtles captured or sited during the entire study period.

## Data analysis

The abundance of sea turtles were represented in a Table. The total %abundance was calculated by dividing the number individual sea turtles per species divided by the total individual sampled and multiplied by 100. The frequency distributions of sea turtles in the sampled sites were presented on a bar chart. Bar chart was created using Microsoft Excel spreadsheet package (2010 version).

A cluster analysis (dendogram) using Bray-Curtis similarity to show the similarity sea turtles based on the sampled sites along the coastline of Delta State, Nigeria. For similarity physico-chemical parameters along the coastal sand of the sampled sites, cluster analysis (dendogram) using Euclidean distance. The cluster analyses were one using PAST [27].

## RESULTS

### Composition and abundance of sea turtles in the sampled sites along the coastline of Delta State, Nigeria

Three sea turtle species were encountered in the course of the entire study period, namely *Dermochelys coriacea* (Leather back), *Lepidochelys olivacea* (Olive Ridley) and *Chelonia mydas* (Green Turtle) (Table 1). *Lepidochelys olivacea* was the most preponderant sea turtle species represented by 25 individuals which accounted for 59.52%, followed by *Dermochelys coriacea* with 14 which accounted for 33.33% represented individuals. *Chelonia mydas* was the least represented sea turtle species with only three individuals which accounted for 7.14% (Table 1). In terms of site composition and abundance of sea turtles, SW1 had the highest number of sea turtles (11), followed by SW5 and SW6 with nine individuals each (Table 1). SW2 had seven sea turtle individuals while SW3 and SW4 had four sea turtle individuals each (Table 1).

Nine *Dermochelys coriacea* were recorded in SW1, while two each were recorded in SW2 and SW6. One *Dermochelys coriacea* was recorded in SW3 and no *Dermochelys coriacea* was recorded in SW3 and SW4 (Table 1). The highest *Lepidochelys olivacea* individuals (9) were recorded in SW5, followed by SW6 (7), four in SW2 and two *Lepidochelys olivacea* each were recorded in SW1 and SW3, and one *Lepidochelys olivacea* was recorded in SW4 (Table 1). *Chelonia mydas* was only represented in SW2 and SW4 with one and 2 individuals, respectively (Table 1).

**Table 1:** Composition and abundance of sea turtles in the sampled sites along the coastline of Delta State, Nigeria

Sea turtle (Scientific name)	Sea turtle (common name)	Sites						Total composition / abundance	%Total composition / abundance
		SW1	SW2	SW3	SW4	SW5	SW6		
<i>Dermochelys coriacea</i>	Leather back	9	2	1	0	0	2	14	33.33
<i>Lepidochelys olivacea</i>	Olive Ridley	2	4	2	1	9	7	25	59.52
<i>Chelonia mydas</i>	Green Turtle	0	1	0	2	0	0	3	7.14
<b>Total</b>		<b>11</b>	<b>7</b>	<b>3</b>	<b>3</b>	<b>9</b>	<b>9</b>	<b>42</b>	<b>100</b>

**Site abbreviations:** SW 1- sea water (Benin River mouth/sea), SW2- Benin River (Benin River mouth/sea), SW3- sea water (Escravos River mouth/sea), SW4-River mouth (Escravos River mouth/sea), SW5- sea water (Forcados River mouth/sea) and SW6-River mouth (Forcados River mouth/sea)

**Frequency distribution of sea turtles in the sampled sites along the coastline of Delta State, Nigeria**

Adult sea turtles were represented in the six sites sampled (Figure 2). The frequency distribution of adult sea turtles were highest in SW2, followed by SW1 and SW6 (Figure 2). SW5 had the lowest frequency distribution of adult sea turtles (Figure 2). Juvenile sea turtles were only present in SW5 and SW6 (Figure 2). The frequency distribution of juvenile sea turtles were highest in SW6, followed by SW2 (Figure 2). The remaining four sites had no juvenile sea turtles. Hatching sea turtles were only present in SW1 and SW5 (Figure 2). The highest frequency distribution of hatching sea turtles was in SW1, followed by SW5 (Figure 2). No hatching sea turtles in the remaining four sites (Figure 2).

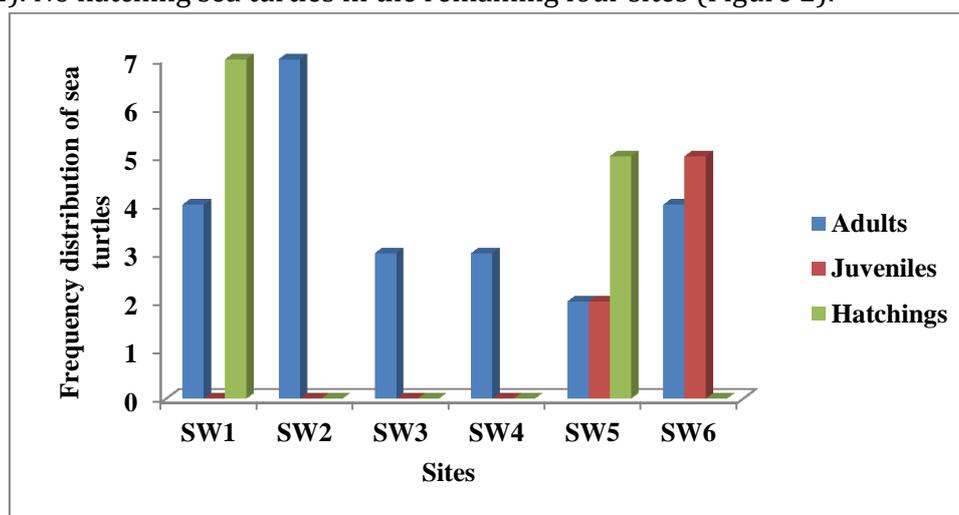
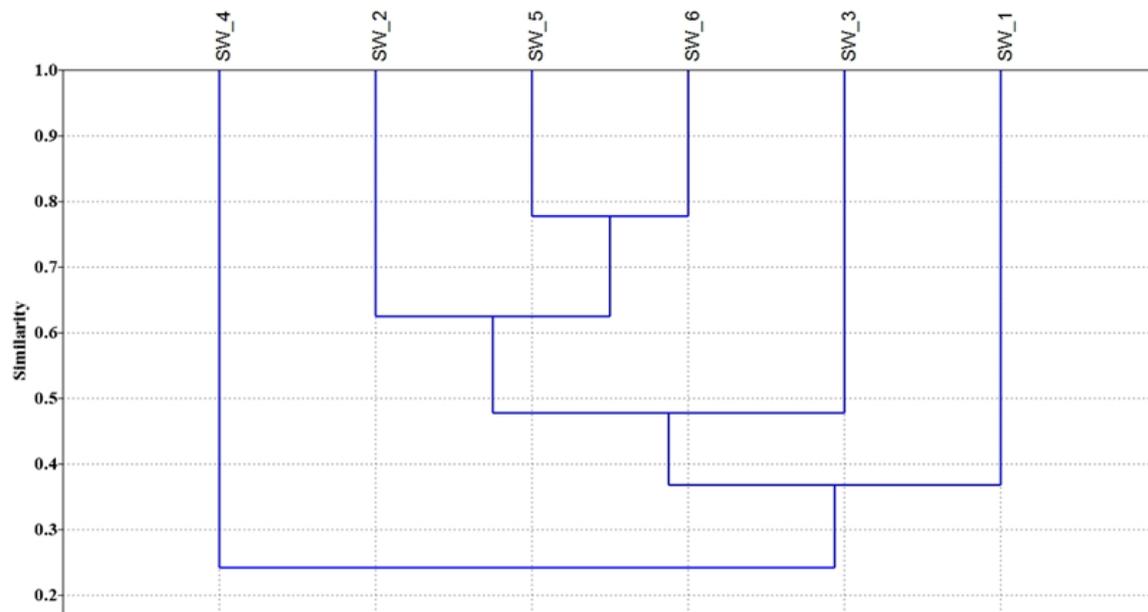


Figure 2: Frequency distribution of adults, juveniles and hatchlings sea turtles observed in the sampled sites along the coastline of Delta State, Nigeria

### Similarity of sea turtles based on the sampled sites along the coastline of Delta State, Nigeria

The dendrogram constructed based on Bray-Curtis similarity index showed the sea turtles were more similar between SW 5 and SW 6 with a similarity value of 0.78 compared to the remaining four sites (Figure 3). The least similar sites are SW1 and SW3 with a similarity value of 0.38 (Figure 3).



**Figure 3:** Cluster dendrogram (Bray Curtis similarity) showing the similarity of sea turtles based on the sampled Sites along the coastline of Delta State, Nigeria

### DISCUSSION

#### Distribution patterns of sea turtles in the sampled sites along the coastline of Delta State, Nigeria

In the present study, a total of 42 sea turtle individuals were recorded. This corroborate with 35 individuals recorded in a recent study conducted in water body in Ilaje, Ondo State, Nigeria [26]. Contrary to the result of the present study is the result of Ohimain *et al.* (2014), who reported to have sighted over 1,500 sea turtles and tortoises in Kolowari and Aven communities in Delta State, Nigeria within the Niger Delta region of Nigeria in the course of their study. This shows the decreasing status of the distribution and composition of sea turtles in the Niger Delta region, as a drastic reduction in the numbers of sea turtles have lately be noticed in recent studies [14] and the present study. Further, Akani and Luiselli [21] recorded 89 individuals in the study on the diversity and distribution of sea turtles in Bayelsa State, Nigeria (Akassa and Brass) and Rivers State, Nigeria (Bonny and Andoni). This is in contrast to the 42 individuals sea turtles collected in the present study, further buttressing the decline in the number of sea turtles that nest within the Niger Delta region of Nigeria, probably occasioned by the incessant human activities and their attendant factors resulting to the decline of the composition and abundance of sea turtles.

Among the sea turtles species recorded in the current study, *Chelonia mydas* (Green turtle) was the least represented with only 3 individuals. The International Union for the Conservation of Nature [28] had recently reported the decreasing status of *Chelonia mydas* (Green turtle) in the water of the west and east central Africa Atlantic. Akani and Luiselli [21] in their study of sea turtle by the West Africa Turtle Conservation Network (WASTCON) have recently been established. The study of sea turtles in West Africa by WASTCON is to ascertain their current status including the distribution and composition within the region of Nigeria and Sierra Leone. They reported that the coordinated research efforts will demonstrate the conservation status, physical status and distribution pattern of sea turtles with the coastal waters of Bights of Benin and Bonny in which the current study area is located. Also, Akani and Luiselli [21] reported in their study in Bayelsa and Rivers States 49 individuals of *Chelonia mydas* as against the 3 individuals recorded in this study. They noted that *Chelonia mydas* were frequently observed to be unevenly distributed by species in the coastline of Akassa, Brass, Bonny and Andoni in Bayelsa and Rivers States. This calls for urgent measures to conserve *Chelonia mydas* and other extant sea turtles species that are noticed to be still nesting in the coastlines of Nigeria, to forestall further decline as observed in the present study.

On the other hand, *Lepidochelys olivacea* represented by 25 individuals which represent 59.52% of the entire sea turtles sampled in the present study. The preponderant of *Lepidochelys olivacea* in the present study area corroborate with the findings of other studies conducted within the Niger Delta region by Ohimain *et al.* [14] in Kolowari and Aven in Delta State, Nigeria who collected 52.25% of *Lepidochelys olivacea* in their study while and elsewhere in Brazil Colman *et al.*, [29] collected 53.8% of *L. olivacea* in the Waters of Sergipe in Brazil. *Dermochelys coriacea* represented by 14 individuals and accounted for 33.33% of the entire sea turtles collected in the present study which was also more abundant than *Chelonia mydas* which was represented by three individuals and accounted for 7.14% of the entire seas turtles collected in this study. The preponderant of *Lepidochelys olivacea* and *Dermochelys coriacea* represent promising species which can be protected to enhance their distribution and composition in the study area. Buttressing this assertion is the report by Ogunjobi and Surulere (2020), who had recently reported the presence of *Dermochelys coriacea* in the Ilaje axis of the Niger Delta region of Nigeria. Further, the dwindling composition of *Chelonia mydas* calls for urgent intervention on how this species and other sea turtles can be protected against going into extinction.

## CONCLUSION

We encountered three out of the five established sea turtles in the coastlines of Nigeria which include Leather back turtle (*Dermochelys coriacea*), Green turtle (*Chelonia mydas*) and Olive Ridley turtle (*Lepidochelys olivacea*). *Lepidochelys olivacea* was the most preponderant, followed by *Dermochelys coriacea*. Overall, relatively low composition and abundance of sea turtles were observed in the cause of the study, and further sea

turtles in the coastline of Delta State was inferred to be sparsely distributed. Sea turtles in SW 5 and SW6 were more similar in distribution pattern compared on the remaining four sites. From our observation, the conservation statuses of the sea turtles encountered in the course of the study were vulnerable, endangered and critically endangered. Judging from the international union for conservation of nature (IUCN) in 2021, it was observed that if care is not taken *Demochelys coriacea* will go into extinction in the coastline of Delta State, Nigeria. The remaining two encountered species are not spared as their conservation status was also either endangered or critically endangered.

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