International Journal of Engineering Applied Sciences and Technology, 2019
Vol. 4, Issue 6, ISSN No. 2455-2143, Pages 234-239
Published Online October 2019 in IJEAST (http://www.ijeast.com)

GEOSPATIAL AND TEMPORAL DISTRIBUTION OF *Pycnanthus angolensis (*Welw.) Warb AND *Diospyros mespiliformis* Hochst. Ex A.D.C IN OBAN DIVISION OF THE CROSS RIVER NATIONAL PARK (CRNP)

Egbe, Alexander Echeng
Maaben Integrated Services, Calabar-CRS

Edoki, Echeng Isaac
Geo-View Consult, Calabar-CRS

Abstract- Man-made and anthropogenic activities over the past years have been observed to threaten biodiversity worldwide. Early detection and mapping of species will help in their management and possible control. This study mapped two plant species (*Pycnanthus angolensis (*Welw.) Warb and *Diospyros mespiliformis* Hochst. Ex A.D.C) in Cross River National (CRNP), Oban Division using Geographic Information System (GIS) tools. The existing map was Scanned, Georeferenced, Digitized, and Plotted with the attribute table and edited. A total of seventy two (72) individuals (with *P. angolensis* recorded 26 individuals, while *D. mespiliformis* had 46 individuals) were censored in the park. Map of CRNP was produced showing these plant species in their respective positions. Queries by attribute and location were generated to test the genuineness of the Database. Result of the study therefore showed GIS tool is an important and integral option in species conservation. Hence, this study suggest a more detail and routine mapping exercise in the park to be carried out to assist park management in monitoring species with declining producing, and early detection of human interference, thus supporting conservation effort in the park.

Keywords: Species, Plant, Monitoring, Conservation, Mapping, Coordinates, Geographic Information System, phytodiversity.

I. INTRODUCTION

Species mapping along temporal and spatial gradients is useful in understanding the concepts of speciation, threats, survivorship, dispersal and availability and utilization of resource materials. It has also been employed in predictive modelling of species declines and increases ([1] Rodriguez et al., 2005). Species area of occupancy and extent of occurrence as determining criteria to quantifying degrees of threats ([2] Baldeck *et al* 2015) and more importantly in the mastering of the processes, mechanisms and the underlying drivers of species orientation is space is one of the importance of species distribution modelling. The employment of geospatial species mapping had become all the most imperative by the application of such data by International Union of Conservation of Natural Resources (IUCN). It has been variously shown that species life history ([3] Lynch and Fagan 2009, [4] Hills 2011) is intricately tied to the thinning rule and survivorship which invariably determines species population density. Throughout all geographic range and times, an inverse relation exists between species distribution and dispersal. Literature is replete in relating species with short life cycle and excellent dispersal mechanisms (dispersal agent and process) to high population density provided anthropogenic influences are at minimum.

Species mapping has found wide usage in forestry practice ([2] Baldeck *et al* 2015). The conservation of wildlings and the exploitation of mature timbers are dependent in part on accurate species location and abundance profile [2] Baldeck *et al* 2015).

In spite of the huge significance species mapping plays in conservation forestry and climate change modulator, almost all phytodiversity data in Africa and majority in the developed countries do not contain elements of distribution and abundance in relation to spatial orientation. This had made mobilization of phyto diversity data and more importantly assessment of extent of threats all the more difficult. This challenge is aptly expressed in the term 'Data Deficient' and 'Not Evaluated' in majority of the plant species in the IUCN database. This is in sharp contrast to that of the fauna list where most have been assessed.

Interestingly, an IUCN category 1 protected forest as Oban has a paucity of published data on its plant holdings. In spite of being classified as one of the 25 biodiversity hotspots of the world and also as a centre of endemism, a visible checklist of its flora resources is non-existent as opposed to what is available for the some parks in Africa typified by the Mpumalanga and Kruger National park in South Africa.

This research therefore aimed at mapping two plant species censored in the Cross National Park, Oban Division.

II. STUDY AREA

This research was carried out in Oban Division of the Cross River National Park (CRNP). The division shares a long border with Korup National Park in the Republic of Cameroon, forming a single protected ecological zone. The division has a rugged terrain, rising from 100 m in the river valleys to over 1,000 m in the mountains (en.wikipedia.org/wiki/Cross_River_National_Park). Figure 1 below is a map showing the study area.

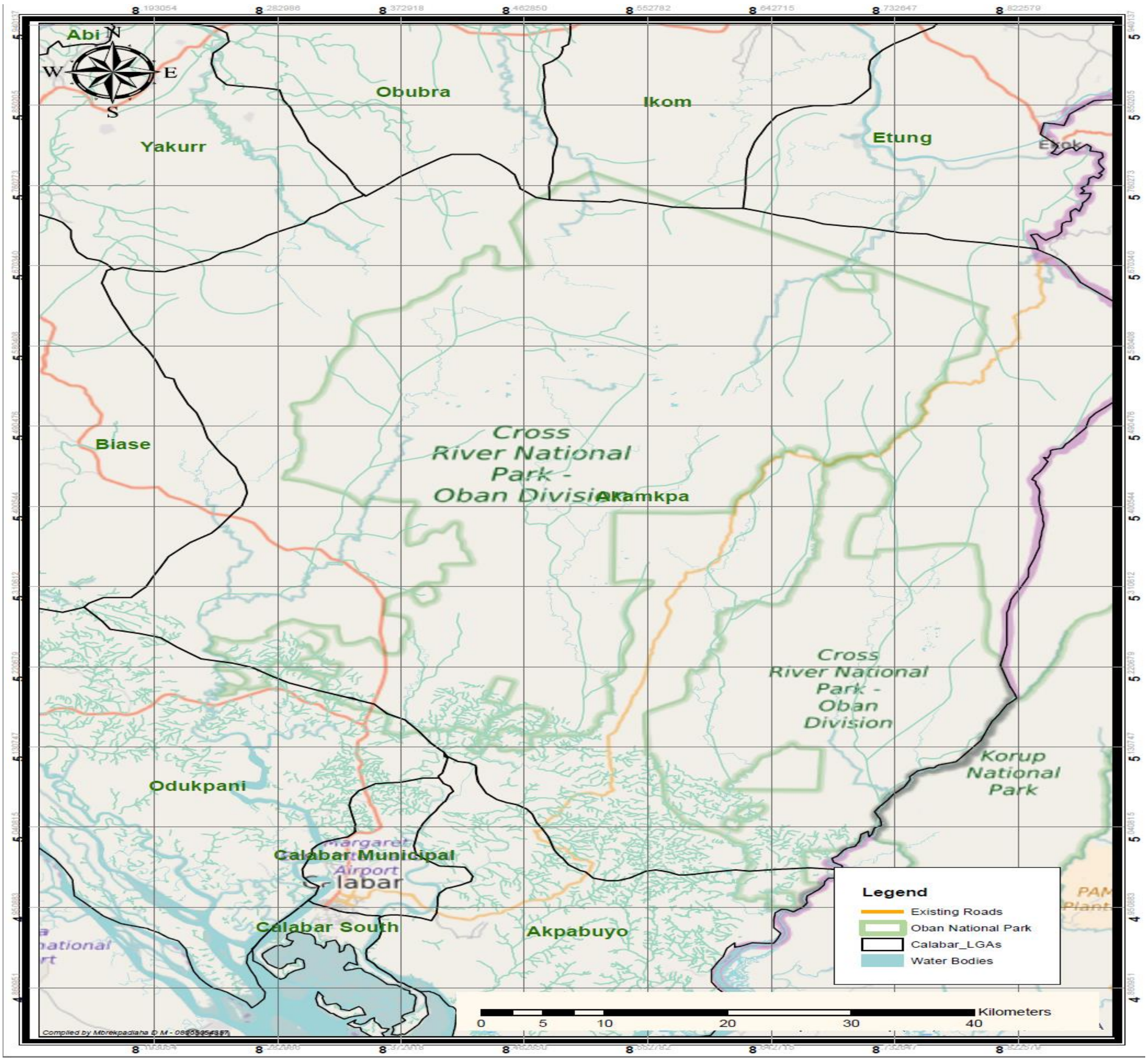

Figure1: Oban Division of the Cross River National Park
Source: CRNP Management (2017)

II. MATERIALS AND METHOD

A. Sampling method: Map of the study area was gridded into 1.5sqcm cells as adopted by [5] Diangha (2001). Fifty (50) plots were randomly selected out of a total of 75 grids throughout the Forest (Oban Division). Each of the cells was further divided into 10 smaller 1.5sqmm cells to facilitate the location of plot position. A random position marked as the SW Corner (plot start position in the field) was chosen for each large grid cell. From the map, latitude and longitude for each

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random position was read out and identified in the field with the aid of a geographic positioning system (GPS). Permanent geo-referenced plots were established. A 50x50m plot size was chosen for the study. Each plot was further demarcated into 25 10x10m subplots. Total plot area for each plot = 2500m² or 0.25ha.

Use of GIS tools in mapping and analysis of some woody plant species in Cross River National Park (CRNP) as adopted by [6] Muhammad *et al.* (2014). This method involves the following steps:

Data capture: Global Positioning System (GPS) was used for collecting the coordinates of the Species of Interest (SoI). The locations of the different SoI were collected by recording the x and y coordinates using the GPS. A unique code number was given to each of the different SoI in such a way that whenever a location of a particular species is to be recorded in the GPS its own code number was written first and then the coordinates were recorded. Hence the prefixes of the number followed by serial number were typed.

Scanning of existing map: The existing map (Map of the study area) was scanned using an AO scanner. The scanned map was brought into an AutoCAD environment using AutoCAD overlay facilities. The analogue map was converted to digital format through the process of scanning.

Geo-referencing: The scanned image of the park was referenced to real world coordinates in order to give it a geodetic significance using AutoCAD over lay. This was done using four corner coordinates of the map.

Digitizing: The different layers of the map such as the boundary line of the park, the road distribution, waterbodies, etc were digitized. This was achieved using appropriate commands in the AutoCAD environment. Each layer of a feature was given a different symbol and colour

Plotting of GPS data: The recorded locations of the different SoI in the GPS were downloaded into the computer system through the use of Map source software. The data was then saved in a DXF extension and exported to AutoCAD where it was overlaid with the digitized map of the CRNP. Consequently distribution map for the SoI was produced displaying automatically, attributes of the tree species and its individuals (See Figure 2). This distribution map, shows the various position of the tree species on the map.

B. Species Inventory: Species were identified using field reference materials of [7] Keay 1989, [8] Nyananyo 2006, [9] Arbonnier 2006, [10] Ebigwai 2012.

C. Species Enumeration: Matured and/or wildlings of each species were manually counted, their co ordinates and abundance recorded for which a map was produced.

IV. RESULT AND DISCUSSION

A total of seventy two (72) individuals of *Pycnanthus angolensis (*Welw.) Warb (26 individuals) and *Diospyros mespiliformis* Hochst. Ex A.D.C (46 individuals) species were sampled as Species of Interest (SoI) in the study area. Figure 2 and Plate 1 presents distribution map and images of the various SoI respectively. The distribution map was created by gridding in such a way that each of the grid lines (longitude or latitude) was directly linked to the position of the respective species using GIS software (Arch View 3.2a) so that position of each of the plant species can be readily and easily read on the map. Hence this provides the most convenient way of assessing, retrieving and updating information about tree species. Consequently managing of tree species has been made simplified.

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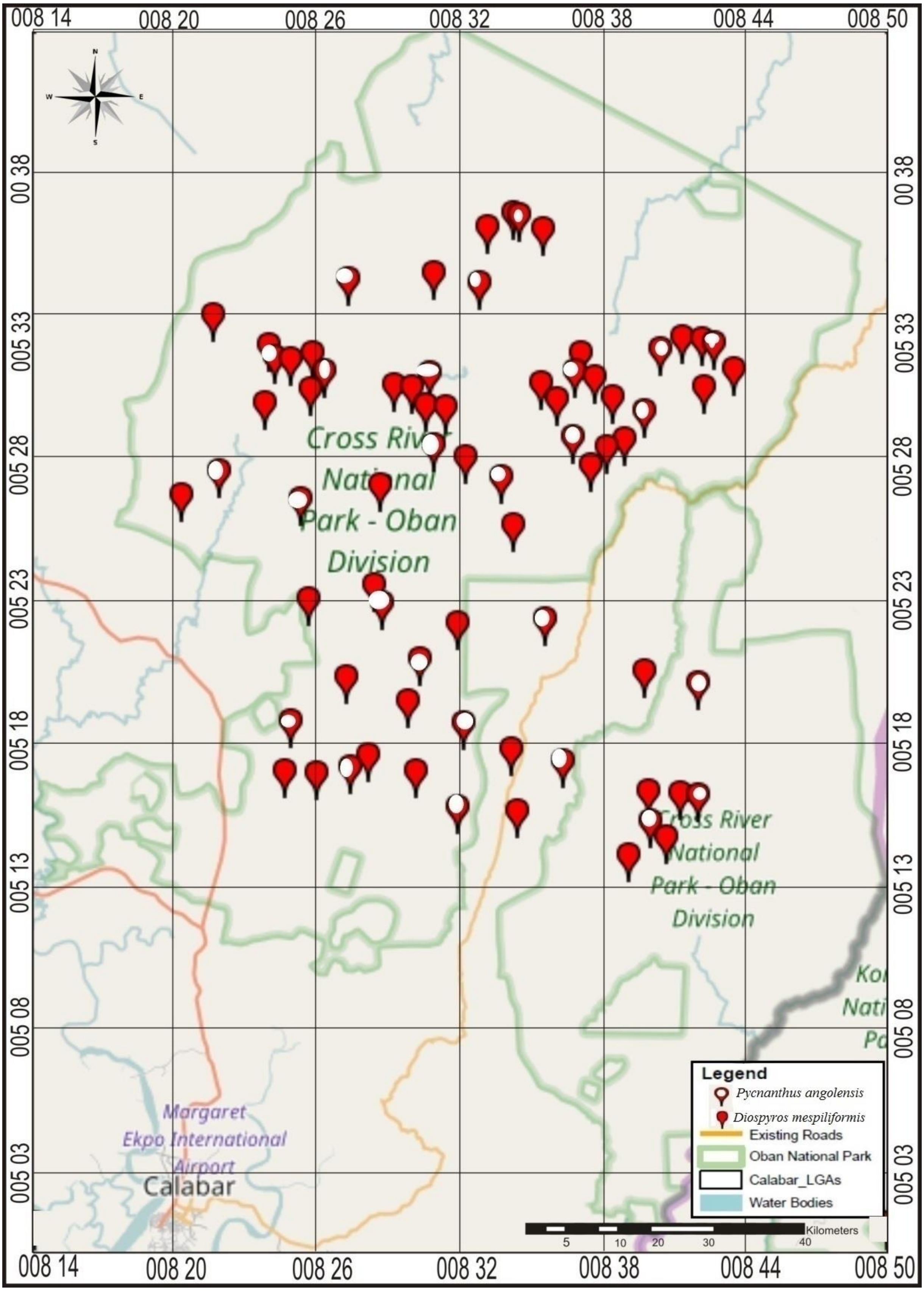

Figure 22: Distribution map of *P. angolensis* and *D. mespiliformis*

Plate 22: *(a) Pycnanthus angolensis (*Welw.) Warb; (b) *Diospyros mespiliformis* Hochst. Ex A.D.

[11] Gaia *et al.* (2014) reported that the used of intending or actual species distributions maps are necessary for many aspects of environmental research, conservation planning and resource management. The identified taxa were spatially represented on a map to show their present position/locations in the park. In the works of [12], [13], used of distribution maps was demonstrated in order to facilitate protection and management of individual species. Hence, combine application of mapping techniques and maps for many species allows park management to identify areas of biodiversity hotspot, areas with unique species assemblages, as well as sensitive areas containing imperilled species.

In this present study, *D. mespiliformis* (46 individuals) species recorded a very high abundance compared to *P. angolensis* with 26 individuals (Figure 2). Each point represents an individual of each of the investigated plant species. The high abundance observed in the section of the park mapped out indicates a rich and diverse flora, thus the needs for mapping of the plant resources of the area. The high abundance recorded could be attributed to the potentials of the region to support different species of plants and animal [6]. According to [14] Ormerod & Vaughan (2005*)* the study area can hold different life forms; hence the reason it has been marked and described as a biodiversity hotspot zone.

Consequently, from the distribution mapped produced for each species, it was clear that the park has a large random distribution component. This conforms to the report of [6] and [15] Jetz *et al.* (2005) who reported that the random distribution and high abundance of most species could be due to the fact that seeds and fruits of most of these species are eaten by some animals and birds thus, most of the patches are found close to the animal routes. According to the study of [16] Maxwel (2002) the first step to manage plants resources of any park on any landscape is to carry out an inventory of the species present in terms of knowing the different species present, where they occur and to know species whose population is declining. This was done for the selected species here referred to as species of interest.

V. CONCLUSION

From the study, there is no gain saying that GIS tool has played a fundamental role in conservation effort.

VI. ACKNOWLEDGMENT

The authors wish to thank the management and staff of Cross River National Park (CRNP), Oban Division for necessary assistance granted us during the field study, especially, the tour guard and park rangers.

VII. REFERENCES

[1] Rodríguez, J. P., Simonetti, J. A., Premoli, A. and Marini, M. A. (2005) Conservation in Austral and Neotropical America: building scientific capacity equal to the challenges. *Conservation Biology,* 19, 969–972.

[2] Baldeck, C. A., Asner, G. P., Martin, R. E., Anderson, C. B., Knapp, D. E. and Kellner J. R. (2015). Operational Tree Species Mapping in a Diverse Tropical Forest with Airborne Imaging

Spectroscopy. *PLoS One* 10 (7): e0118403. doi: 10. 1371/journal.pone.0118403

[3] Lynch, H. J. and Fagan, W. F. (2009). Survivorship curves and their impact on the estimation of maximum population growth rates. *Ecology*, 90, 1116-1124

[4] *Hill, A. (2011). Reimagining Equality: Stories of Gender, Race, and Finding Home. Boston, Mass:* human cell lines. *Human Cell*, 19**,** 43–8.

[5] Diangha, M. N. (2001). Botanical inventory of the Banyang-Mbo Wildlife Sanctuary, South West Province, Cameroon: Final report prepared for the Wildlife Conservation Society Cameroon Biodiversity Programme Banynag Mbo Wildlife Sanctuary.

[6] Muhammad, M., Abdulhameed, A. and Abdullahi, M. B. (2014). Mapping of exotic plant species in Yankari Game Reserve using GIS tools. *International Journal of Applied Biological Research*, 6(1), 141-14

[7] Keay, R. W. J. (1989). *Trees of Nigeria.* Oxford University Press, New York, 476pp

[8] Nyananyo, B. L. (2006). Plants from the Niger Delta. Onyoma Research Publications, Port Harcourt and Rivers State. 403pp.

[9] Arbonnier, M. (2006). Trees, shrubs and lianas of West African dry zones. CIRAD, Margraf publishers GMbh, MNHN, Paris France. 573pp

[10] Ebigwai J. K. (2012). Keys to Plant Identification. University of Calabar Press. 33pp

[11] Gaia, V. L., Jonathan, C. C., Qi, C., Jeremy, A. L., David, A. C., Leila, G., Fabio, D. F., Franco, M. & Riccardo, V. (2014). Biodiversity mapping in a tropical West African forest with airborne hyperspectral data. *Plos One*, 9(6), 91-97

[12] Abdulhameed, A., Sabo, A., Gani, A. M. and Sanusi, S. S. (2001). Phytosociological studies of asite Adjoining Yankari National Park, Bauchi state, Nigeria. *R e s e a r c h J o u r n a l o f Science*, 7 (12), 7-16

[13] Allen, J. A., Brown, C. S. and Stohlgren, T. J. (2009). Non-native plant invasions of the United States National Parks. *Biological invasions*, 11(10), 2195-2207.

[14] Ormerod, S. J. and Vaughan, I. P. (2005). The continuing challenges of testing species distribution models. *Journal of Applied Ecology*, 42 (4), 720-730.

[15] Jetz, W., Rahbek, C. and Lichstein, J. W. (2005) Local and global approaches to spatial data analysis in ecology. *Global Ecology and Biogeography*, 14, 97–98.

[16] Maxwell, B. D. (2002). "Inventory" Invasive Plant Management: Center for Invasive Plant Mnagement, Bozeman, MT. Montana state university. 239pp