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Morphology and Distribution of *Piptadeniastrum africanum* (Hook.f.) Brenan and *Cathormion altissimum* (Hook.f.) Hutch. & Dandy in Bayelsa State, Nigeria

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Abstract: *This study assessed the morphology and distribution of Piptadeniastrum africanum (Hook.f.) Brenan and Cathormion altissimum (Hook.f.) Hutch. & Dandy in Bayelsa state, Nigeria. Field study was carried in 36 communities across the 8 Local Government Areas in Bayelsa state from 2014 – 2018. The morphological characteristics were studied based on physical observations. The study found that the two plants are characteristically different based height, number of pinnae and leaflets, length and of seeds. Other distinguishing morphological characteristics are the smooth or spiny nature of their stems and the petals arrangement. The study also found that C. altissimum is evenly present in the riverine communities when compared to P. africanum. The decline in the relative abundance of P. africanum is due to over exploitation as a result of its premium value as timber species for construction and carpentry words. The study has been able to resolve the problematic taxonomy of the plants among some indigenous people of Bayelsa state who claim that the plants are the same, existing as upland and water species or one is male and the other is female. Again, there is the need for the conservation of these plant species within the locality especially P. africanum.*

Keywords: *Bayelsa state, Cathormion altissimum, Distribution, Morphology, Piptadeniastrum africanum*

1. INTRODUCTION

Piptadeniastrum africanum (Hook.f.) Brenan is a tropical rain forest tree that can grow up to 45-50 m high and 3-5 m in girth. The plant has conspicuous plank-like buttresses, straight bole, with fine fern-like foliage. The plant also bears seeds of about 20-25 mm usually attached to the margin of the pod by a slender thread running from the middle and each is provided with wings that are papery, dark brown, and elongated (Brenan, 1955; Nyananyo, 2006).

The wood of *P. africanum* is very important in the construction/ carpentry industry for building of bridges, flooring, cabinets, canoe etc (Burkill, 1995; Jiofack, 2008; Fern, 2014). Different parts (root, bark and leaves) of *P. africanum* are commonly used in traditional medicine. Decoctions made with the bark of the plant is used for the treatment of cough, bronchitis, headache, mental disorder, haemorrhoids, genito-urinary infections, stomach-ache, dysmenorrhea, male impotence among others (Burkill, 1995; Fern, 2014).

Cathormion altissimum (Hook.f.) Hutch. & Dandy is a deciduous tree found in riverine and fresh swamp water forests. The plant can grow up to 15 m in height. The young ones of the plant usually have spines. The plant bears fruit in pods which are usually twisted into the shape of a coil and constricted between the one-seeded segments (Keay, 1989; Royal Botanic Garden, 2018). The plant bears fruit from February to March and July to November (Keay, 1989). In Bayelsa state, the tree is common in the seasonally flooded forests.

The seed of *C. altissimum* is fermented and used as soup condiment in some part of Nigeria (Lemmens, 2006; Jolaoso et al., 2012). Decoctions made with the bark of plant is used for the treatment of tooth-ache, stomach–ache and pulmonary infections, while decoction made from the leaf is used is used as vapour bath to treat cold (Lemmens, 2006).

P. africanum is of great interest due to its wide range of ethnobotanical uses – domestic, social and agricultural applications. Thus studies have concentrated on its chemical constituents and their usefulness to man (Ateufack et al., 2015; Owoeye et al., 2018). Consequently, there are comparatively few taxonomic studies that are necessary to clear the doubts that surround its problematic taxonomic status both locally and globally. Names such as *Piptadeniastrum manni* Oliver with an unresolved status and low confidence level is currently placed in the Plant List (2010), though placed as a species of the genus *Piptadeniastrum* Brenan in TROPICOS (2013). Moreover, reports of certain varieties of *Piptadeniastrum africanum* such as *Piptadeniastrum africanum var. africanum* and *Piptadeniastrum africanum var. brachysperma* Pellergr exist in literature (The Plant List, 2013). *Piptadeniastrum africanum* (Hook.f.) Brenan is endemic to tropical Africa. In the Niger Delta, it occurs on river banks in the riverine areas of the rain forest (Nyananyo, 2006). Some indigenous people claim that *P. africanum* and *C. altissimum* are same. As such there appears to be confusion about the taxonomic status of both plants. Some are of the opinion that one of them is male while the other is female.

In Bayelsa state, there is excessive exploitation of timber trees due to easier means of transportation as hinterlands are rapidly getting connected by roads. This is causing a speedy depletion of timber tree species populations especially in the coastal regions which were once rich in these tree species.This could lead to extinction of endemic tree species and endanger those that are vulnerable (Oguntala et al., 2000; Nodza et al., 2013). Trees such as *P. africanum* that has high demand for canoe carving and timber products is being affected by over exploitation with little or no control measures. Therefore, this study aimed at assessing the morphological characteristics and distribution of *P. africanum* and *C. altissimum* in Bayelsa state, Nigeria.

2. MATERIALS AND METHODS

2.1. Study Area

The study was carried out in Bayelsa State which is made up of eight Local Government Areas (Figure 1). The state is located within latitudes $04^0 15^{'}$ North and $05^0 23^{'}$ south and longitudes $05^0 22^{'}$ West and $06^0 45^{'}$ East. It is bounded by Delta State on the North, Rivers State on the East and on the west and south by the Atlantic Ocean (Figure 1). There are several surface waters in the state which are called by different names including rivers, streams, creeks, creeklets, rivulets based on their sizes. The water table in the area is quite high which varies according to the season (Agedah et al., 2015). The rate of water flooding in the area has increased in recent times with most coastal communities being submerged almost on annual bases. In these coastal communities, the rate of lumbering has also increased. The timber products, often called planks, are moved through the water ways to land and then transported within and outside the state. The timber species in forests within the state are now becoming rare partly due to extensive exploitation with little or no control/regulation measures on the part of the state.

2.2. Sample Collection And Identification

Field trips were under taken to all the local government areas of Bayelsa state (Figure 1) to assess the distribution of *P.africanum* and *C. altissimum* in the area. The plant specimens were identified at the Forest Herbarium Ibadan of the Forestry Research Institute of Nigeria (FRIN) and the Herbarium of the Department of Plant Science and Biotechnology, University of Port Harcourt, Rivers State. Voucher Specimens of the plants were deposited in these herbaria for reference and further studies.

2.3. Morphological Studies

Morphological studies involved physical observation, counting and measurement of both qualitative and quantitative diagnostic characters of the stems, leaves, flowers and fruits of the plants under study. The basic morphological characteristics of both plants studied include habit, height, number of pinnae, number of leaflets, length of leaflet, shape of leaf apex, colour of flowers, length of pods, width of pods, length of seeds, number of seeds, ovary, petals, rachis, stem and root.

2.4. Distribution studies

The plants were qualitatively distributed based on their occurrence in 36 communities and the adjoining forests across the 8 Local Government Areas. Plants available only in distant forests or special reserves within towns were designated as "+"; plants sighted scarcely in nearby forests are designated as "+ +"; plants sighted easily in nearby forests are designated as "+ + +"; and plants sighted commonly within town and nearby forests are designated as "++++". On the overall, a plot of

the distribution of both plants was made and a distribution map of the plants in the study area was constructed.

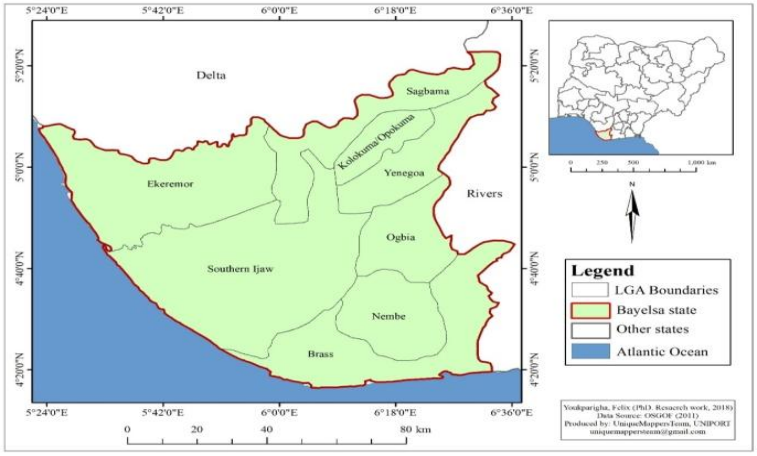

Figure1. *Map of Bayelsa State, Showing the Local Government Areas*

3. RESULTS AND DISCUSSION

The stems of the plants are different.*P. africanum* has a smooth and clear stem, while the stem of *C. altissimum* has spines especially in the juvenile stage (Figure 2).The root of *C. altissimum* is chractistically different from that of *P. africanum* which has planklike, broad, root butressess (Figure 2). Figure 3 presents the morphological chractristics of leaves and pod of *P. africanum* and *C. altissimum*.

The pods of *C. Altissimum* are coil-shaped, while *P. africanum* has lanceolate pods. For *P. africanum* and *C. altissimum* the colour of flower is Yellowish white and white respectively (Figure 3), length of pods is 20 -30cm and 10-28 cm respectively, width of pods is 1.5 -3cm and 1.3-3cm respectively, length of seed is 8-9mm and 6.5 – 7mm respectively, number of seed is 8-9 and 12 – 20 (Table 1). Both plants (*P. africanum* and *C. altissimum*) have varying heights, number of pinnae and leaflets which are characteristically higher in *P. africanum.* The shape of leaf apices of both plants is Obtuse. The ovaries of *P. africanum* and *C. altissimum* are both superior. The petals of *P. africanum* are free and oblong to lanceolate, while they make a tubular corolla in *C. altissimum.* Based on habits, *P. africanum* is a tree while *C. altissimum* could be a Shrub or tree (Table 1).

Table1. *Important Morphological Features of P. Africanum and C. Altissimum*

Morphological character	***P. africanum***	***C.altissimum***
Habit	Tree	Shrub or tree
Height	45-50m	5-35m
Number of pinnae	10-19pairs	5-7pairs
Number of leaflets	25-60pairs	11-22pairs
Length of leaflet	1.5-8.5mm	7-15mm
Shape of leaf apex	Obtuse	Obtuse
Colour of flowers	Yellowish white	white
Length of pods	20-30cm	10-28cm
Width of pods	1.5-3cm	1.3-3cm
Length of seeds	3-9.5mm	6.5-7mm
Number of seeds	8-9 seeds	12-20 seeds
Ovary	Superior, ellipsoid	superior
Petals	Free, oblong to lanceolate	Tubular corolla
Rachis	Absence of glands	Cushion shaped glands
Stem	Not spinous	often spinous
Root	Large,thin, plank-like buttresses	Not plank-like

The morphological characteristics of *P.africanum* (Hook. f.) Brenan has been well described by several author such as William (1951), Keay (1989), Nyananyo (2006), Jiofack (2008). Similarly, Hutchinson and Dalziel (1958), Bingham et al. (2017) and Royal Botanic Garden (2018) have described the morphological features of *C.altissimum* (Hook. f.) Hutch. & Dandy.

Morphological characters are features of external form. They are useful in providing clues for practical plant identification on the field. Morphological characters were the first evidences used for classification by plant systematists before the emergence of anatomical, phytochemical and molecular evidence. The reason was due to the ease of observation of morphological characters found in both the vegetative and reproductive parts of plants (Judd *et al.*, 2012).However, morphological approach to taxonomy suffers some disadvantages such as the difficulty in ascertaining reproductively isolated species which are nearly or completely morphologically indistinguishable; and the difficulty in differentiating between environmental influences and genetic variation on the phenotype of an organism (Hillis, 1987). Based on the morphological chracteristics, both plant is chracteristically different.

Figure2. *Morphology of The Root And Stem-Bark of P. Africanum and C. Altissimum*

Figure3. *Morphology of leaves and pods of P. Africanum and C. Altissimum*

The distribution *P. africanum* and *C. altissimum*in Bayelsa state, Nigeria is presented in Table 2 and Figure 4.The field survey of the area of study showed that *P. africanum*, though not threatened, is not common but widely distributed (Jiofack, 2008; ILDIS, 2013). Based on the distribution *C. altissimum* has higher occurrence rate in most of the communities studied compared to *P. africanum* (Figure 4).*P. africanum* is now a rare wood in the market because it is now available in very distant forests with a very high cost of procurement that many lumberjacks are not willing to pay. The result of the availability of this plant mostly in very distant forest is the poor knowledge about this plant for the average Bayelsan, especially the youths. Only elders and youths that work particularly in the wood industry have some knowledge of this very important plant.

Table2. *Distribution of P. Africanum and C. Altissimumin the Study Area with Their Coordinates*

Forest/Community	LGA	*P. africanum*	*C.altissimum*	Date
Agrisaba	Nembe	+ + +	+++	22/09/15
Aguobiri	Southern Ijaw	+	+++	16/06/18
Akakumama	Nembe	+	+ +	24/10/15
Akipelai	Ogbia	+++	+++	14/06/18
Akumoni-Okordia	Yenagoa	+	+++	20/06/18
Amassoma	Southern Ijaw	++	+++	06/06/18
Amatolo	Sagbama	+	+++	07/06/18
Angalabiri	Sagbama	+	+ ++	25/10/15
Anyama	Southern Ijaw	++	+++	16/06/18
Anyamasa	Ekeremor	+	+++	18/06/18
Beletie-Ama	Brass	+++	++++	15/06/18
Biseni	Yenagoa	++	+++	20/06/18
Bomadi-Ekpetiama	Yenagoa	+	+++	06/06/18
Egeibiri	Southern Ijaw	++	+++	16/06/18
Egweama	Brass	++	++++	15/06/18
Emadike	Ogbia	++	+++	25/05/18
Emeyal	Ogbia	+	+ ++	07/05/14
Epebu	Ogbia	++	+++	09/06/18
Etiema	Nembe	+ +	+++	02/09/15
Ewoama	Brass	++	+++	14/06/18
1gbedi	Kolokuma/Opokuma	+	+ + +	07/05/14
Igbogene	Yenagoa	+	+ + +	25/09/16
Isampou	Ekeremor	+	+++	18/06/18
Ogbia	Ogbia	+	+++	14/06/18
Ogbolomabiri	Nembe	++	+++	14/06/18
Ogobiri	Sagbama	++	+ + +	04/08/14
Okpoama	Brass	+++	+++	14/06/18
Okunbiri	Sagbama	++	+++	06/06/18
Opume	Ogbia	++	+++	16/06/18
Otatubu	Nembe	+	+++	02/09/15
Otuasega	Ogbia	+	+ ++	14/09/15
Otuoke	Ogbia	+	+ ++	07/05/14
Sabagreia	Kolokuma/Opokuma	+	+++	08/06/18
Toru-Ebeni	Southern Ijaw	+	+++	08/06/18
Toru-Orua	Sagbama	++	+++	18/06/18
Twon-Brass	Brass	++	+++	14/06/18

Legend: + (Available only in distant forests or special reserves within town); + + (sighted scarcely in nearby forests); + + + (sighted easily in nearby forests) ++++ (sighted commonly within town and nearby forests)

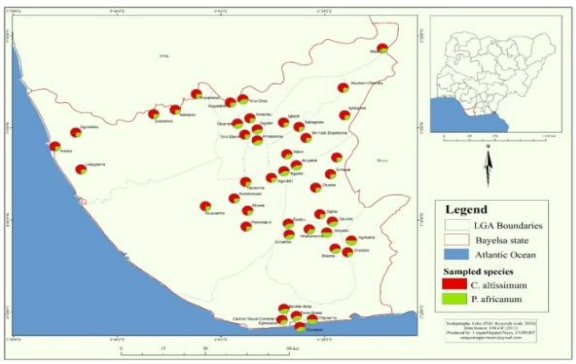

Figure4. *Map showing the Distribution of P.africanum and C. altissimum in Bayelsa State*

4. CONCLUSION

The study has been able to clear the doubt that *P.africanum* and *C. altissimum* are same. It is clear that *P.africanum* and *C. altissimum* belong to different genera based on their morphological characteristics. The distribution of *Piptadeniastrum* in Bayelsa State and its taxonomic status carried

out in this study revealed that it is widely distributed in Bayelsa State and it is monotypic. The only species in the genus is *Piptadeniastrum africanum* (Hooker filius) Brenan, basionym: *Piptadenia africana* Hooker filius. The study found that *P. africanum* is fast depleting in our forest like many other valuable timber species. For the purpose of knowledge for future generations, there is need for botanical gardens or forest reserves to conserve these plants in Bayelsa State.

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