

2<sup>nd</sup> Rufford Small GRANT  
Mid-REPORT  
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**Improving sustainable conservation of red ironwood  
within communities surrounding some protected  
areas in Nigeria**

By

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## 1.0 Introduction

Continuous, site-specific monitoring of vulnerable species, that are increasingly threatened by habitat loss, land-use change, and unsustainable exploitation, is necessary for effective biodiversity conservation in tropical environments. In West and Central Africa, *Lophira alata* (Ochnaceae), also referred to as red ironwood, azobé, or ekki, is still one of the most extensively exploited wood species (Doumenge & Sene, 2012). Despite the species' economic (Wahab, 2015; Babawale et al., 2016) and ecological significance, its natural populations have drastically decreased throughout Nigeria, primarily due to logging pressure, increased agricultural production, and inadequate natural regeneration (Africa Regional Workshop, 1998). Building directly on our initial Rufford-funded study in Cross River National Park—which identified limited distributions, population fragmentation, and pressing conservation threats—our subsequent species distribution modeling confirms that Southern Nigeria provides consistently suitable climatic habitats, establishing the critical geographic foundation now guiding the targeted conservation of *L. alata*, informed by this inventory data (Oyebanji et al. 2025). These results highlighted the necessity of extending population reassessment and citizen science to additional southern Nigerian forest strongholds outside of CRNP.

Within the historical range of *L. alata*, Okomu National Park in Edo State is one of the few remnants of lowland rainforest in southwestern Nigeria. The complex canopy structure, significant rainfall, and dense, humid evergreen forest contribute to optimum biological circumstances for the species. However, Okomu National Park has also faced increased anthropogenic pressures, including illegal logging, farm encroachment, and the extraction of non-timber forest products. Given the combination of habitat fragmentation and extractive pressure, it is possible that the threat to *L. alata* populations in Okomu National Park is comparable to or worse than that of those in CRNP.

Based on this, the status, composition, and spatial arrangement of the population of *L. alata* within Okomu National Park were reexamined in the second stage of the conservation project. This stage also aims to record habitat features, measure tree dimensions-diameter, height, and spatial arrangement-identify location-specific threats, and develop an integrated conservation strategy that takes into consideration both ecological data and the inputs of the community. The extended survey is very

important in defining the overall conservation status of the species nationally, enhancing habitat suitability predictions, and making recommendations backed by data on the long-term management of its surviving populations.

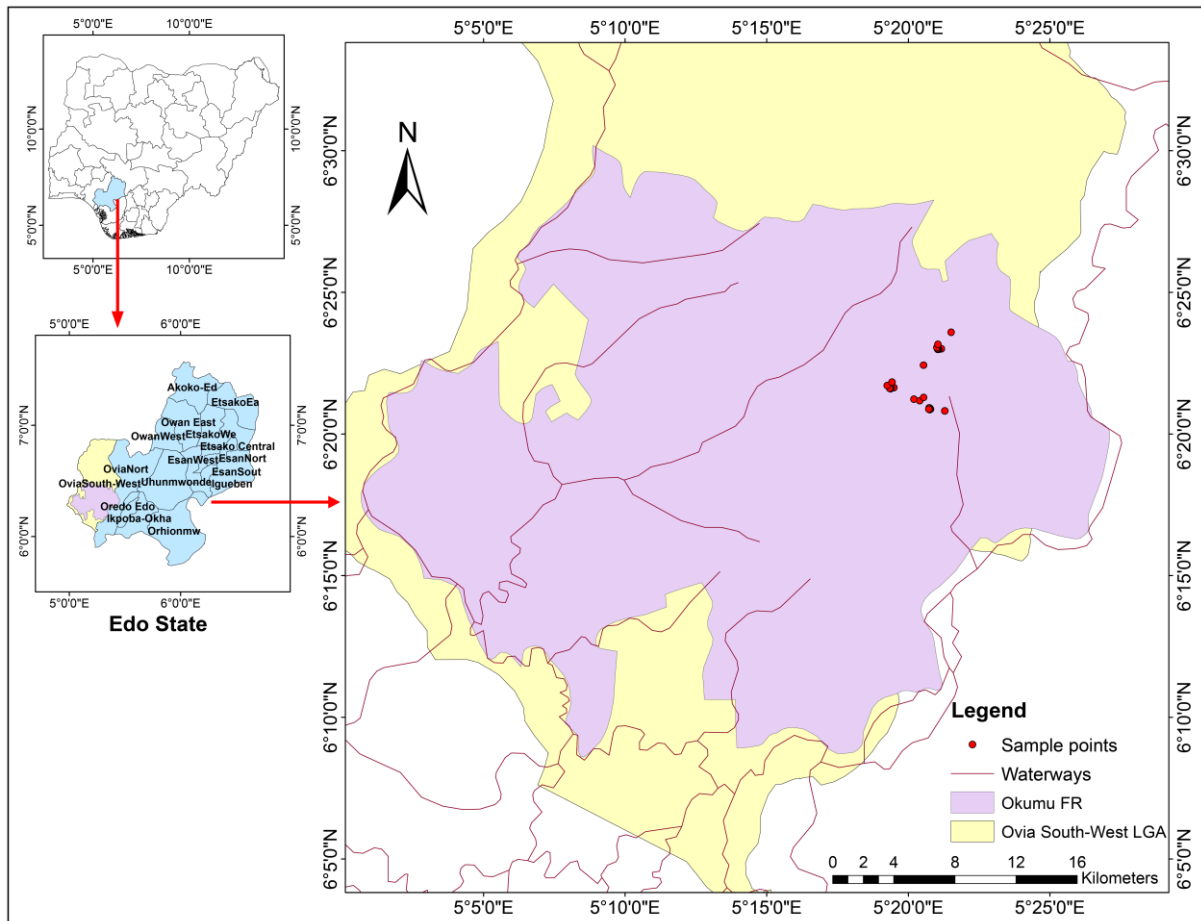
## **1.1 Objectives**

1. A comprehensive population census of *L. alata* will be conducted to map its distribution, abundance, and demographic structure within Okomu National Park and adjacent community forests.
2. To improve community stewardship based on participatory knowledge-sharing and co-development of locally led guidelines for conservation of *L. alata*
3. To initiate evidence-based population reinforcement through enrichment planting of *L. alata* seedlings in low-density or poorly regenerating areas, thereby supporting the recovery of the species in the National Park area.

## **2.0 Methods**

### **2.1 Study area**

The present study was carried out in Okomu National Park, a protected area of ca. 200 km<sup>2</sup> situated in southern Nigeria within latitude 6.25–6.42° N and longitude 5.17–5.33° E. Lying within the lowland rainforest belt of Edo State, the park forms one of the last remaining fragments of moist tropical forest in southwestern Nigeria and represents an important biodiversity refugium in an increasingly fragmented landscape. The relief is generally low-lying, with altitudes ranging between 30 to 150 meters above sea level and receives rainfall ranging between 1,800–2,500 mm annually. Despite being surrounded by farming communities and exposed to edge effects, logging pressure, and past disturbance, Okomu National Park still contains significant conservation value because of its rich flora, including populations of the focus species *L. alata*. Its isolation and the continuous human pressures emphasize that this area is among the priority sites for targeted conservation research and intervention needed for the protection of threatened tree species remaining in Nigeria's residual forest reserves.



**Figure 1. Location map of the study area**

## 2.2 Data collection

### 2.2.1 Field assessment and allometry

Fieldwork for this study was done in two distinct phases, commencing with a two-week reconnaissance survey in March 2025. From this initial survey, a proper assessment of the general study area and its surrounding communities was possible, which helped in logistical planning and identification of preliminary zones of interest for the focus species, *L. alata*. The main, intensive data collection was then carried out from April to June 2025 (**Plate 1**). This period covered the full range of planned project activities, to be undertaken sequentially in an integrated manner. The activities entailed an in-depth preliminary site investigation, setting up temporary on-site nurseries for raising seedlings, structured training workshops for the local participants recruited, ethical gathering of wildlings (naturally germinated seedlings) for possible reinforcement planting, comprehensive measurement of critical tree

biometric parameters, and community-oriented conservation education and awareness campaigns aimed at ensuring local stewardship.

A systematic sampling design was used to ensure strong and representative data on the population structure of *L. alata*. A network of linear transects was established within the park to provide unbiased coverage of the forest matrix. On each transect, a sample plot of 50 m<sup>2</sup>, were laid out randomly (but not less than 25-meter apart) to create a spatially balanced sampling grid. Within every plot, individual stand of *L. alata* was identified and carefully counted. Standard dendrometries data for all enumerated *L. alata* individuals were collected. Diameter at breast height (DBH, at 1.3 m) was measured to the nearest 0.1 cm using a diameter tape. Total tree height was assessed with a Spiegel Relascope. The geographic coordinates of each occurrence (latitude, longitude) were also accurately recorded with the help of a handheld GPS device. Thus, a detailed geo-referenced inventory was enabled, which provides an accurate account of the species distribution across the sampled areas and allows for its future monitoring.



**Plate 1: Field sampling for data collection (a) Establishment of the sampling of plots and (b) measurement of tree parameters**

### **2.2.2 Conservation education and engagement**

We embarked on community conservation education and engagement because their contribution is essential in conservation projects involving 10 communities and seven schools. To capture intergenerational and promote long-term stewardship, targeted educational seminars and participatory workshops were organized even to capture younger ones under the “Catch Them Young” principle. These activities were carried out in September 2025, aimed at evaluating the local socioeconomic role of *L. alata*—including its use in construction, traditional medicine, and cultural practices—and investigating their beliefs, perceptions, and potential receptiveness toward conservation initiatives.

Here, we incorporated different approaches to assess local attitudes, identify barriers to conservation, and foster participation in preservation of *L. alata*. The approaches used include administration of structured questionnaires (n = 500), semi-structured interviews and focus group discussions, one-on-one discussion conducted across various community segments, including farmers, traditional leaders, forest officers, NGOs, students, and youth representatives. Our awareness program and campaign benefited from posters, pamphlets, jingles, and rallies while prizes (customized exercise books) were given to students that participated excellently during the quizzes.



**Plate 2: Initial conservation education and briefing of the project with the students and Okomu National Park officers with our team. See more pictures in Appendix Figures A-E**

### **2.2.3 Capacity building and forest reinforcement activities**

Capacity building efforts were made practical by providing hands-on activities focused on facilitating the translation of awareness from the community toward concrete conservation action (**Plate 2**). Beginning with the latter stages of the project's implementation, community-level conservation was employed for the monitoring and management of *L. alata* within the locality. Capacity-building training workshops were provided for the community on resource conservation management, the integration of agroforestry practices, and the development of alternate means for ensuring the lifting of pressure from the *L. alata* naturally growing within the ecosystem. To help further the in-situ reinforcement process, community-level nurseries were set up for growing *L. alata* seedlings from wildlings. The community were also involved in the field work and planting of the wildlings in the identified forested area within the Okomu National Park, school, and the community.

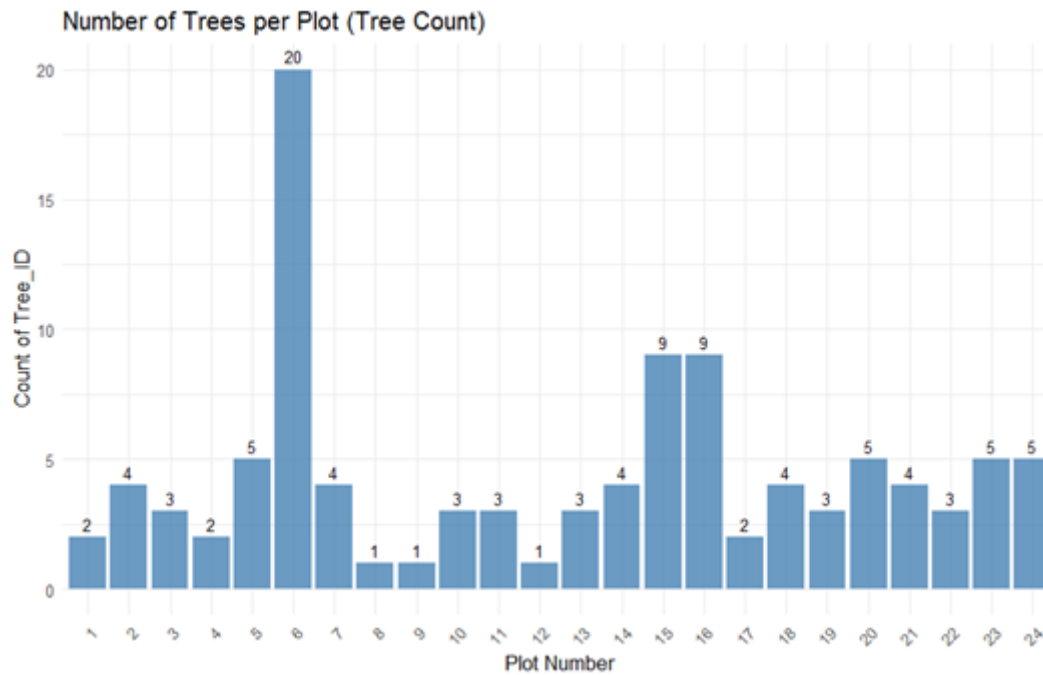
Involvement from the communities was made possible for planting, maintenance, and monitoring efforts for enhanced local ownership and responsibility. Success for these efforts was made measurable using the development of factors such as the survivability rates for the planted seeds and actual participation in activities for planting efforts, the actual incidence level for the occurrence of illegal log-gathering activities within the region, and the establishment and functionality level for the development of community conservation forums.

### **3.0 Results**

*Objective 1: To carry out an in-depth species re-assessment aimed at documenting the population status and distribution of *L. alata* across localities.*

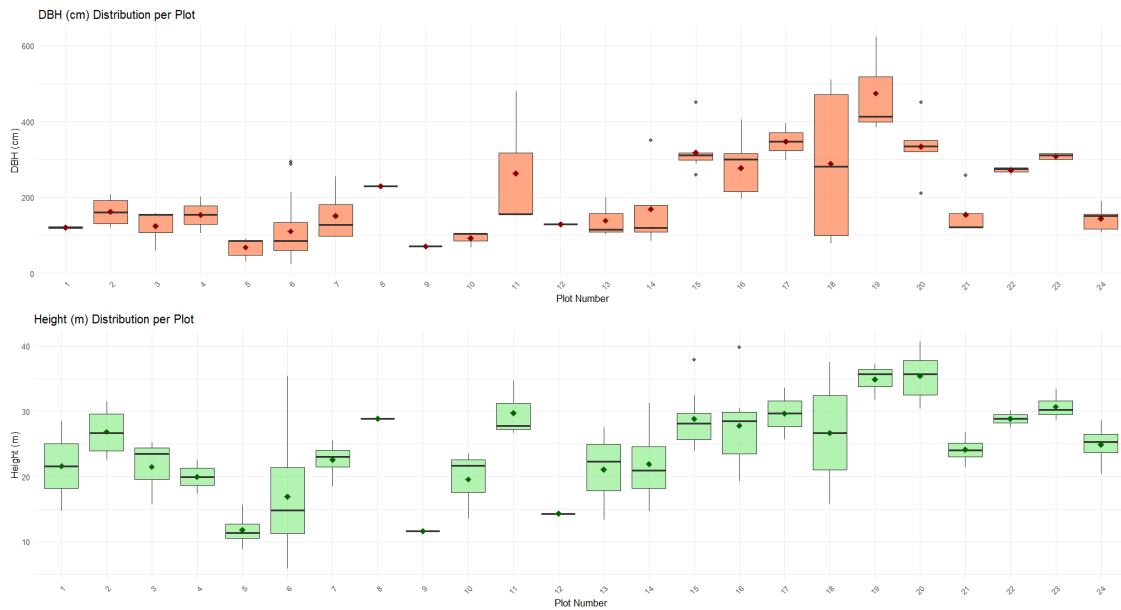
#### **3.1 Data-Driven Insights from forest inventory**

From the forest inventory, we observed that it hosts a highly heterogeneous *L. alata* population, where a total of 105 stands were recorded from 24 plots, showing great variation in tree density, size distribution, and distribution pattern (**Figure 2; Appendix 1; Table 1**). Plot 6 has the highest stem density with highest number of 20 individual trees, whereas several plots, including plots 8, 9, and 12 had only one individual, indicating a highly heterogeneous distribution pattern of recruitment or perhaps disturbance factors in these sites. Nevertheless, a great variation in DBH was observed among the population ranging from 23.8 cm (Plot 6) to 623.5 cm (Plot 19), thus pointing towards a multiple age population and thereby confirming the heterogeneous *L. alata* population study site as structurally complex and an actual old-growth forest population. Similarly, a great variation is observed in tree heights ranging from 5.9 m (Plot 6) to a maximum of 40.7 m (Plot 20), suggesting a highly stratified distribution of the population comprising both juvenile, medium and emergent individuals. In fact, a highly heterogeneous distribution of tree structures is observed in Okomu National Park, indicating the need for preservation of landscape heterogeneity sites for *L. alata* at microhabitat level to enhance population resilience for effective biodiversity.

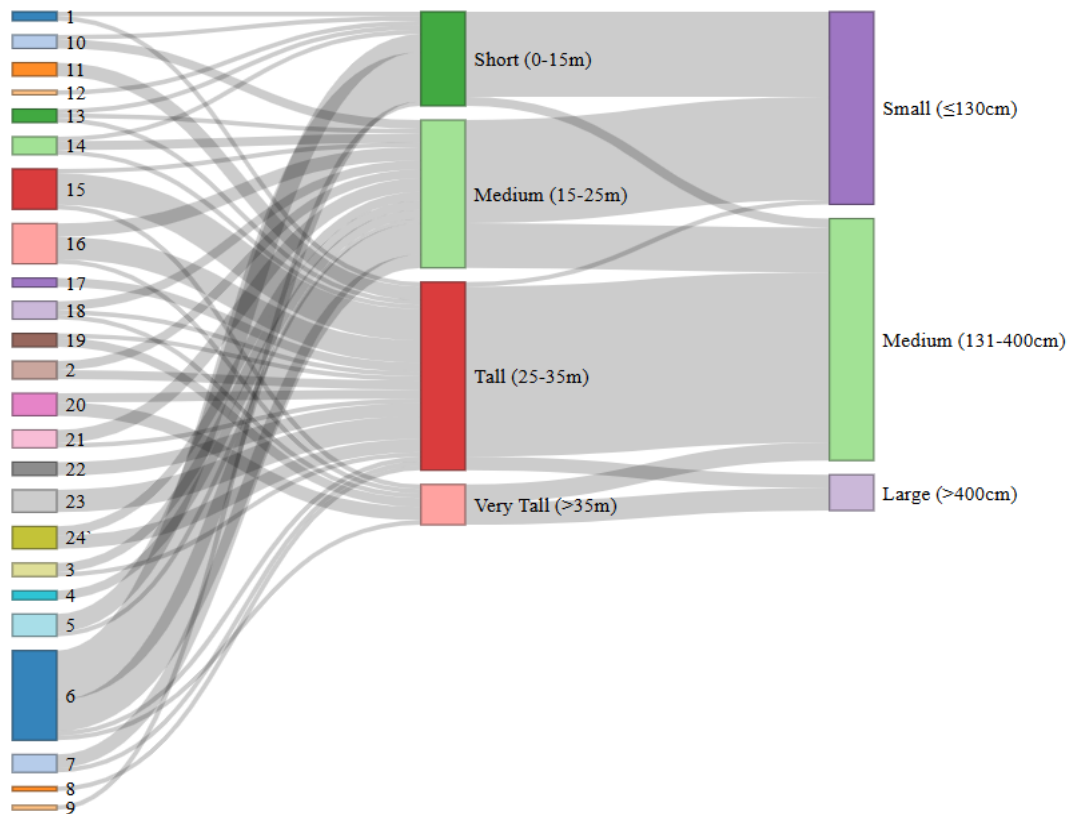


**Figure 2: Number of trees per plot identified in Okomu National Park, Nigeria**

The occurrence of highly large stands ( $\geq 450$  cm DBH) in Plots 11, 15, 18, 19, and 20 and highly tall stands ( $\geq 37$  m) in Plots 15, 16, 18, 19, and 20 indicates the existence of vital core old-growth features, and thus, immediate conservation treatments should target the formation of keystone habitat structures (**Figures 3-4**). The evident diversity of size classes, especially in Plots 5, 6, 10, 14, and 15, verifies the continuous process of natural regeneration and stand structural diversity, and as such, might serve as vital habitat for forest establishment and development. In contrast to this, stands with very low and highly irregular stand structure (e.g., Plots 8, 9, 12, 17, 22, and 24) might indicate localized difficulties in forest regeneration for enrichment planting and restoration to enhance stand and landscape connectivity. Conversely, the habitat of the endemic *L. alata* is threatened by the conversion of forest into agricultural areas, logging activities, and debarking (**Plate 3**).



**Figure 3: Allometry measurement distribution across the sampled plots within Okomu National Park, Nigeria**



**Figure 4: Sankey diagram explaining the pathways of size class succession for *L. alata* at the Okomu National Park, Nigeria. The succession pathways are represented by a stream of elements (trees) from plot classes (left) to both height classes (middle) and finally to DBH classes (right).**

**Table 1: Distribution and range of measurements *L. alata* in each sampled plot**

<b>Plot</b>	<b>Trees Measured</b>	<b>DHB (cm)</b>	<b>Height (m)</b>
1	2	115.6 - 125.2	14.7 - 28.5
2	4	119.3 - 206.8	22.6 - 31.5
3	3	60.4 - 156.6	15.7 - 25.2
4	2	105.7 - 200.7	17.3 - 22.6
5	5	29.4 - 90.5	8.9 - 15.6
6	20	23.8 - 293.6	5.9 - 35.4
7	4	97.4 - 254.8	18.5 - 25.6
8	1	229.4	28.9
9	1	70.4	11.6
10	3	67.1 - 104.2	13.5 - 23.5
11	3	154.2 - 478.6	26.7 - 34.7
12	1	128.4	14.3
13	3	101.7 - 198.8	13.4 - 27.5
14	4	85.4 - 350.6	14.6 - 31.2
15	9	259.6 - 450.7	23.9 - 37.9
16	9	195.6 - 405.7	19.3 - 39.8
17	2	298.5 - 395.7	25.7 - 33.6
18	4	79.2 - 510.8	15.8 - 37.5
19	3	385.6 - 623.5	31.8 - 37.2
20	5	210.3 - 451.2	30.4 - 40.7
21	4	117.8 - 257.5	21.4 - 26.8
22	3	257.6 - 280.5	27.5 - 30.1
23	5	298.4 - 315.7	28.7 - 33.4
24	5	107.4 - 189.4	20.4 - 28.6



**Plate 3: Evidence of in situ threats on the focal species in Okomu National Park, Nigeria**

### **3.2 Citizens science: Insights from administered questionnaires and education**

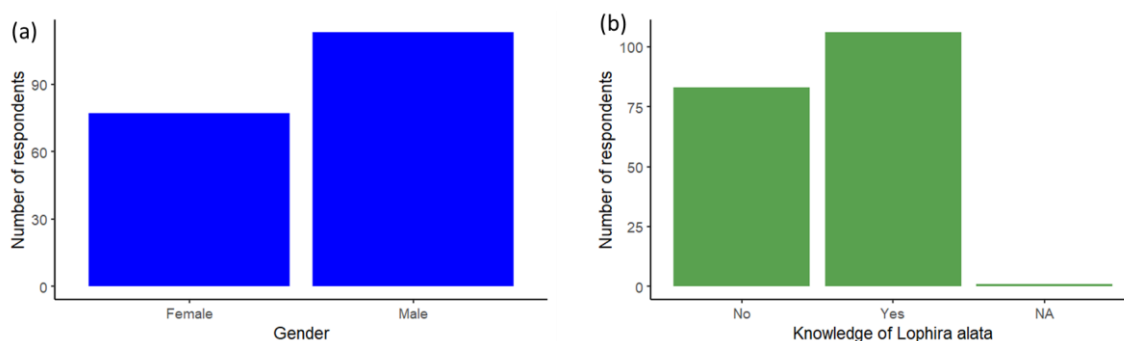
*Objective 2: Threat identification from the field and excerpts from the field survey and structured questionnaire*

We identified in-situ threats such as conversion of forest land for agricultural purposes, logging, and debarking (**Plate 3**). These are indices that are causing the distribution dynamics of the focal species within the study area. In conjunction with the local community, we raised 200 wildlings, of which 190 were reintroduced to the sites where we had one stand while 10 were spatially planted within school and communities. We found that most of the local community couldn't identify the wildlings of *L. alata* and this presents a fundamental problem for the conservation of these species in this area. This may imply the species are deliberately eliminated for agricultural purposes, similar to our observations in the first project in CRNP (Oyebanji et al. 2025). One hundred and ninety questionnaires retrieved from three communities, three schools, and National Park officers were collated and analyzed here. These are, therefore, intermediate results; the entire set of questionnaires will be analyzed for the final report.

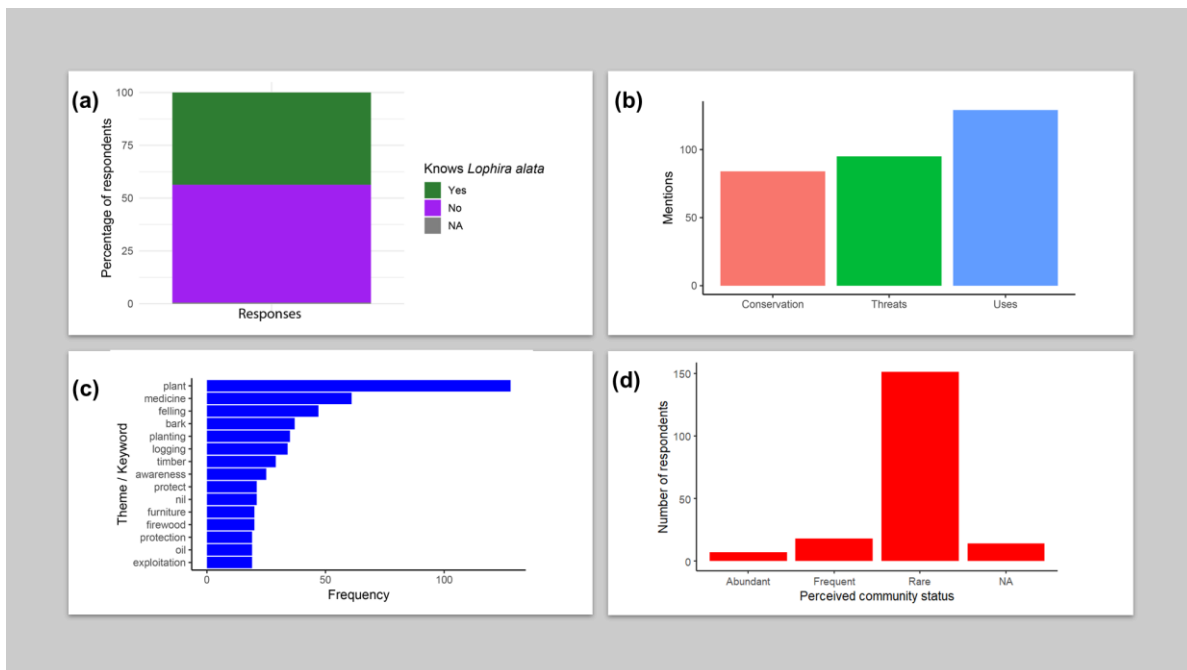
The demographic and knowledge-based results revealed through the questionnaires, indicate broad awareness of *L. alata* within the Okomu and its environments, though with notable variation in perception and experience. Male respondents slightly outnumbered females (**Figure 5a**), suggesting stronger participation of men in the survey and questionnaire administration, likely reflecting gender roles in forest-

related activities. Most respondents reported being familiar with *L. alata* (Figure 5b), indicating that the species is well known locally. However, when knowledge was examined by gender, responses were uneven and dominated by those who were unable to correctly identify the species (Figure 6a).

Narrative responses further reinforce the ecological and socio-economic importance of *L. alata* while also pointing to conservation challenges. As evident, thematic analysis of open-ended responses shows that uses of the species (e.g., timber, medicine, fuelwood) were the most frequently mentioned, followed by perceived threats and conservation actions (Figure 6b). Keyword frequency analysis highlights terms such as “plant,” “medicine,” “felling,” “logging,” and “bark” as dominant in respondents’ narratives (Figure 6c), underscoring both utilitarian value and pressure from exploitation. Most respondents mentioned that they would rather cultivate (plant) the species than to log it, if they had prior conservation knowledge about it. Perceptions of community-level abundance were strongly skewed toward rarity, with the majority of respondents describing *L. alata* as a rare species in their environment (Figure 6d). This aligns with field observations and suggests the growing concern over the species’ local availability. In sum, these findings suggest that while *L. alata* remains culturally and economically significant, its continued use without adequate regeneration, protection, or community-driven management may be contributing to its perceived continuous decline, thus underscoring the need for targeted conservation interventions informed by local knowledge.



**Figure 5 : Demographic and conservation awareness of the community. (a) Gender distribution of respondents who participated in the *Lophira alata* community survey and (b) Overall level of respondent knowledge of *Lophira alata* across surveyed communities.**



**Figure 6. Perspectives from the citizen science towards conservation of *L. alata*.** (a) Proportion of respondents with knowledge of *L. alata* disaggregated by gender; (b) Thematic structure of community responses showing the relative emphasis on species uses, perceived threats, and conservation-related concerns; (c) Frequency of dominant keywords extracted from respondent narratives, highlighting major uses, threats, and conservation concerns associated with *L. alata*; (d). Perceived community-level status of *L. alata*, categorized as rare, frequent, or abundant.

### *Objective 3: Conservation education and reintroducing the species into its natural habitats*

Our conservation education recorded over 200 participants from the communities. The community leaders were first trained prior to general conservation education (**Plate 4**). We conducted conservation education and iterated on the economic and ecological importance of the *L. alata* (**Plates 5-6**). After the species was introduced and discussed with the community members, they acknowledged that *L. alata* is under increasing pressure from overexploitation, particularly for furniture production, land clearing and charcoal production. Demographic observations revealed that both men and women are actively involved in activities that contributes to the decline of *L. alata* populations in their natural habitats. Interestingly, the community was so excited about the project, and they provided practical alternatives and conservation-oriented

suggestions that could help mitigate the ongoing population decline of *L. alata* and support more sustainable management of the species.



**Plate 4: Overview of conservation education within the surrounding communities of Okomu National Park, Nigeria**



**Plate 5: Planting of the species within the community and reintroduction within Okomu National Park, Nigeria**

We are excited about the population of the secondary pupils (over 150 participants) in the neighboring communities that were in attendance. The students were engaged in class teaching and quizzes to evaluate their involvements in the project (**Plate 6**). The Catch Them Young approach also started with identification of the species and reiterate on the conservation of *L. alata*. It is worth mentioning that all the stakeholders largely supported the project and rendered help during the visit. Citizen science has improved the approaches to the strategic implementation of conservation of *L. alata* in Nigeria. However, the detailed conservation recommendations from the community will be analyzed and presented in the final report.



**Plate 6: Overview of conservation education under the “Catch Them Young” principle at schools**

#### **4.0 Conclusion**

This project offers both an assessment and evaluation of the population and conservation status, threats and needs of *L. alata* in Okomu National Park and surrounding communities located in Edo State, Nigeria. Importantly, to change the people’s attitude to the overexploitation of the focal species and forest degradation. Data from the forest inventory revealed high variation in distribution pattern, stem sizes, and height indicating a multi-aged complex structural characteristic that have experienced either limited regeneration or human threats or combination of both. The

survey revealed areas that require the introduction of the species and plots that could be hubs for genetic resources (seed bearing large trees). These dynamics have been complemented by evidence from agricultural expansion, cutting tree trunks, and debarking from human activities. While *L. alata* is known and highly valued, lack of species identification at the juvenile levels leads to unintentional species destruction, and most respondents view the species are rare. We promoted citizens science through conservation awareness and education, and stakeholder's meetings at different scales which has touched over 200 community members and 150 students. The volunteers from the community were trained and assisted in the reintroduction or replanting exercises in the National Park and communities.

### **Acknowledgement**

Many thanks to the management of Okomu National Park for granting access to the study site. We are also grateful to the community leaders for their cooperation and help. I specially thank the project team—Chukwuma Emmanuel, Agbo-Adediran Adewale, Adewumi Deborah, Odewo Peter, Omobude Daniel, Oiwoh Mike, and for their diligence, hardwork and commitment to the success of the project. We are very grateful to 2<sup>nd</sup> Rufford Small Grant for funding the project N° 46085-2.

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## Annexes

**Table S1 : Population assessment of *Lophira alata* across 24 plots in Okomu National Park**

Plot	Tree_ID	Decimal_Longitude	Decimal_Latitude	DHB_cm	Height_m
1	1	N06,20.819	E005,21.294	125.2	28.5
1	2	-	-	115.6	14.7
2	1	N06,20.908	E005,20.767	119.3	22.6
2	2	-	-	135.1	24.4
2	3	-	-	185.7	31.5
2	4	-	-	206.8	28.9
3	1	N06,20.917	E005,20.753	156.6	23.5
3	2	-	-	153.4	25.2
3	3	-	-	60.4	15.7
4	1	N06,20.919	E005,20.742	200.7	17.3
4	2	-	-	105.7	22.6
5	1	N06,20.872	E005,20.784	46.7	11.4
5	2	-	-	90.5	15.6
5	3	-	-	29.4	8.9
5	4	-	-	85.2	10.5
5	5	-	-	87.1	12.7
6	1	N06, 20.860	E005,20.761	131.5	14.7
6	2	-	-	91.4	11.4
6	3	-	-	293.6	35.4
6	4	-	-	287.6	33.2
6	5	-	-	165.7	14.7
6	6	-	-	66.1	10.8
6	7	-	-	213.4	21.4
6	8	-	-	94.5	13.6
6	9	-	-	77.1	14.9
6	10	-	-	138.9	15.4
6	11	-	-	113.2	21.4
6	12	-	-	47.1	10.5
6	13	-	-	46.5	18.9
6	14	-	-	74.6	18.7
6	15	-	-	60.1	21.4
6	16	-	-	99.2	23.1
6	17	-	-	23.8	5.9
6	18	-	-	75.1	11.9
6	19	-	-	59.4	10.2
6	20	-	-	45.6	10.1
7	1	N06,20.873	E005,20.727	98.1	22.5
7	2	-	-	97.4	18.5
7	3	-	-	254.8	25.6
7	4	-	-	155.1	23.5

Plot	Tree_ID	Decimal_Longitude	Decimal_Latitude	DHB_cm	Height_m
8	5	N06,23.009	E005,21.175	229.4	28.9
9	1	N06,22.984	E005,21.076	70.4	11.6
10	1	N06,22.982	E005,21.046	104.2	21.7
10	2	-	-	67.1	13.5
10	3	-	-	104.2	23.5
11	1	N06, 23.015	E005,21.031	154.2	27.8
11	2			478.6	34.7
11	3			155.7	26.7
12	1	N06, 23.053	E005,21.012	128.4	14.3
13	1	N06, 23.165	E005,21.053	101.7	13.4
13	2	-	-	198.8	27.5
13	3	-	-	114.6	22.3
14	1	N06, 21.637	E005,19.491	115.9	22.4
14	2			122.4	19.4
14	3			85.4	14.6
14	4			350.6	31.2
15	1	N06,21.641	E005,19.404	450.7	37.9
15	2			316.7	32.4
15	3			259.6	25.7
15	4			318.7	27.6
15	5			298.5	23.9
15	6			307.4	28.1
15	7			312.8	28.8
15	8			289.5	25.4
15	9			310.9	29.7
16	1	N06,21.595	E005,19.376	320.4	27.6
16	2	-	-	220.5	19.3
16	3	-	-	215.6	29.5
16	4	-	-	405.7	39.8
16	5	-	-	315.1	30.4
16	6	-	-	310.4	29.9
16	7	-	-	299.6	28.5
16	8			195.6	21.6
16	9			207.9	23.5
17	1	N06, 21.605	E005,19.349	395.7	33.6
17	2			298.5	25.7
18		N06, 21.707	E005,19.260	105.7	22.7
18				457.8	30.7
18				79.2	15.8
18				510.8	37.5
19	1	N06, 22. 428	E005,20.540	623.5	35.7
19	2			413.6	31.8
19	3			385.6	37.2

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Plot	Tree_ID	Decimal_Longitude	Decimal_Latitude	DHB_cm	Height_m
20	1	N06, 21. 829	E005,19.430	320.7	32.5
20	2			334.8	35.7
20	3			451.2	40.7
20	4			350.7	37.8
20	5			210.3	30.4
21	1	N06, 21. 170	E005,20.407	120.1	23.6
21	2			257.5	26.8
21	3			117.8	21.4
21	4			122.6	24.5
22	1	N06, 21. 229	E005,20.203	275.4	28.9
22	2			280.5	30.1
22	3			257.6	27.5
23	1	N06, 21. 290	E005,20.545	310.4	28.7
23	2			315.7	31.6
23	3			300.5	29.5
23	4			315.6	33.4
23	5			298.4	30.2
24`	1	N06, 23. 589	E005,21.517	107.4	20.4
24`	2			115.6	23.7
24`	3			155.7	26.5
24`	4			189.4	28.6
24`	5			150.6	25.3

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**Appendix Figures A-E: Snapshots of the conservation education “Catch Them Young”.**