

Survey Report

Habitat Use and Abundance of Parrots, Turacos and Hornbills at Okomu National Park and Oil Palm Plantations of Okomu Oil Palm Company PLC.

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Summary

Large frugivorous birds including parrots, hornbills and turacos play important roles in forest ecosystems, but populations of these species are often threatened due to habitat loss resulting from expansion of agro-commodities, hunting and capture. As part of a project to understand how to reconcile the conservation of Endangered African Grey parrots and the expansion of oil palm production in Nigeria, surveys of large frugivorous birds were conducted in Okomu National Park and three oil palm plantations of Okomu Oil Palm Company PLC in Edo state over a 12 month period. Across all locations, eleven species of large frugivorous birds were recorded: African Grey Parrot, African Pied Hornbill, Black-casqued Hornbill, Great Blue Turaco, Green Turaco, Piping Hornbill, Red-billed Dwarf Hornbill, Western Grey Plantain-eater, White-thighed Hornbill, Yellow-billed Turaco, and Yellow-casqued Hornbill. The greatest species diversity (ten species) was encountered at Okomu National Park, with nine, seven and four species encountered in Extension II, the Okomu Main Estate, and Extension I respectively. The highest density of frugivorous birds was found in Okomu National Park, followed by HCV areas of the Main Estate and then Extension II. The IUCN listed Endangered African Grey parrots and Vulnerable Yellow Casqued Hornbills were found in all the sites and majority of encounters within oil palm plantations were within HCV areas (21.75% for African Grey parrot and 9.19% for Yellow Casqued Hornbills). The count of parrot numbers observed at a communal roosting site in the nursery section of the Main Estate, using night vision binoculars, fluctuates between 455 and 921 individuals and shows seasonal variations throughout the year. We found little evidence that African Grey parrots feed on cultivated oil palm fruit with most observations of feeding parrots concerning wild foods within HCVs. These surveys indicate that the wider Okomu Landscape (National Park, plantations and surrounding areas) supports a globally important population of African Grey parrots and efforts to protect key resources (feeding, nesting and roosting areas) for parrots across this landscape should be prioritized by all stakeholders.

Background

Large frugivorous birds play important roles in forest ecosystems, but populations of these species are often threatened due to habitat loss and hunting and capture. As they typically range over large areas, the abundance and behaviour of these species can be valuable indicators of the health of ecosystems and functioning of wider landscapes. Surveying the abundance and behaviour of large frugivorous birds can therefore help understand the impacts of human activities and inform management approaches, to protect ecosystems and globally important populations of threatened birds.

The expansion of plantations for oil-palms and other agro-commodities which are typically grown as mono-crops poses risks to biodiversity, including large frugivorous birds. To mitigate these threats, systems to protect areas of important habitat and promote biodiversity-friendly management practices have been implemented, such as the protection of areas of High Conservation Value (HCV) including forest patches and sites/areas of wildlife preference within the agro-commodity plantations. The HCV approach is not intended to be a tool for zero deforestation or zero biodiversity loss, but rather to be used as a tool for protecting critical biological, social, and other environmental resources (Senior et al., 2015). The conservation value of HCV areas has been much debated (Miller-Rushing et al., 2019), however little research has been conducted in Africa into how birds use these areas, the potential role that oil palm plantations may play as refuges from hunting and capture and their position within wider forest landscapes.

A number of previous observations led by the principal investigator of the current study suggest that Okomu National Park and Okomu Oil Palm Company PLC are important landscapes for some species of parrot, turacos and hornbills in Nigeria, with observations of nesting/breeding, feeding and communal overnight roosting. This lowland rainforest zone is characterised by largely natural (e.g. forested areas within the national park) and human modified (small- and large-scale cultivation of oil palm, cocoa, bitter kola etc) landscapes. Information on the seasonal variations in abundance and behaviour of these bird groups, among which are species classified as globally Threatened on the IUCN Red List of Threatened Species (including African Grey parrots *Psittacus erithacus* and Yellow-casqued hornbill, *Ceratogymna elata*) could help inform better conservation management of the landscape.

In this report. we present results from independent surveys on the abundance and behaviour of large frugivorous birds (parrots, turacos and hornbills) in Okomu National Park and Oil Palm plantations of Okomu Oil Palm Company PLC, conducted by a team of researchers from University of Nigeria Nsukka across three separate oil palm plantations in collaboration with the World Parrot Trust and funded by Conservation Leadership Programme).

Methods

Surveys of large frugivorous birds were conducted quarterly in the National Park and in each of the three oil palm plantations between August, 2022 and May, 2023 These surveys were led by Ifeanyi Ezenwa and a team from the University of Nigeria Nsukka including Chike Ebido, Chinemerem Orakwelu and Chioma Okechukwu and involved a combination of transect surveys and counts of parrots at communal overnight roost sites. Dr Rowan Martin

(project technical adviser from the World Parrot Trust) joined the team in November, 2022 to inspect the survey protocol.

Transect surveys – Line transect were identified within the National Park and the plantations and walked by the team between the hours of 7.00 and 11.00 am (WAT), the period when parrots and other large frugivorous birds were most active. Transects were walked at a speed of approximately 2 kmh^{-1} and birds detected through a combination of visual and acoustic cues, although most were detected from the latter, adopting a similar survey technique to Dueker et al., (2019). When an individual or group of parrots, turacos or hornbills were encountered, data were recorded on the group size, behaviour (feeding, perching, flying, nesting), time of day and the habitat (age category). Within plantations, transects were positioned so that survey time was stratified across areas of palms of different ages ("young palm" = ≤ 8 years; "middle-age palm" = 8 - 20 years; "old palm" = >20 years) and High Conservation Value areas (HCV). Within Okomu National Park transects were positioned along existing paths and tracks. Encounter rates were calculated by dividing the number of individuals and groups seen by the duration of survey effort.

At the various sites, we also recorded the presence/evidence of threats including illegal logging and hunting activities along the transects.

Counts at overnight communal roosts – The number of parrots using overnight roosting sites were counted after dusk between the hours of 7:30-9:00 pm (WAT) using night vision binoculars. To our knowledge this is the first time this approach has been used for monitoring parrots and we are preparing a manuscript describing details of the methods used for publication in a peer-reviewed journal.

Results and Discussion

Species composition, distribution, abundance and behaviour

Eleven species of large frugivores were recorded throughout the survey duration across all areas visited: African Grey Parrot (Psittacus erithacus), African Pied Hornbill (Lophoceros fasciatus), Black-casqued Hornbill (Ceratogymna atrata), Great Blue Turaco (Corythaeola cristata), Green Turaco (Tauraco persa), Piping Hornbill (Bycanistes fistulator), Red-billed Dwarf Hornbill (Lophoceros camurus), Western Grey Plantain-eater (Crinifer piscator), White-thighed Hornbill (Bycanistes albotibialis), Yellow-billed Turaco (Tauraco macrorhynchus), Yellow-casqued Hornbill (Ceratogymna elata). While ten species were encountered within the forest of Okomu National Park, the diversity and abundance within the plantations was lower with, 4, 9, and 7 were encountered at Extension I, Extension II and the Main Estate of the plantations respectively (figure 1a). Within the various plantations, frugivorous birds were substantially more abundant within HCV areas followed by the "old palm" (Figure 1b). Within the National Park, the abundance varied depending on habitat preference of the species - for instance Great Blue Turacos were mostly encountered at forest edges, Yellow-billed Turacos were sighted mostly in the forest interior and the hornbills and parrots were more evenly distributed when compared to other species. Spent bullet casings from barrel guns, likely associated with hunting, were detected at HCV area within Extension II.

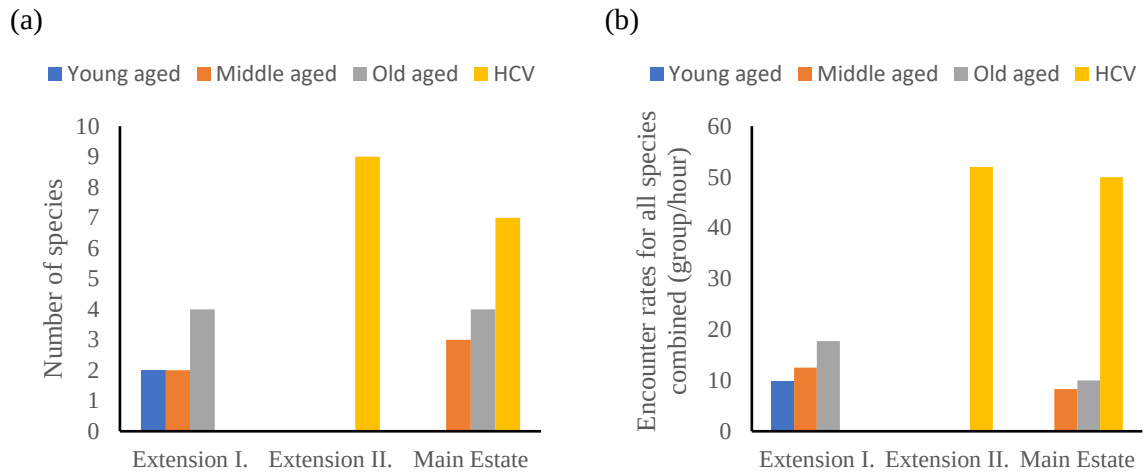

Figure 1: Variation between plantations and across different habitat types in a) species richness and (b) encounter rates of large frugivorous birds.

The number of detections of each species are presented in Annex 1 and a summary of encounter rates aggregated by site and habitat type is presented in Annex 2. Figure 2 shows the encounter rates of the species across the sites. African Grey Parrots were the most frequently observed large frugivorous bird within the Main Estate of the plantations. In Extension II, however, turacos and hornbills exhibited a relatively equal presence and level of activity. The behaviours of the parrots observed included feeding on forest trees within the HCV, courtship and overnight communal roosting at the Nursery field of the Main Estate. Despite being a commonly reported food for African Grey parrots (Dueker et al., 2019), we rarely observed the parrots feeding on oil palm fruit. Of the 91 encounters of African Grey parrots inside oil palm plantations, only 3 were observed feeding on oil palm fruit. Discussions with plantation workers also confirmed that African Grey parrots are only very rarely seen to feed on oil palm fruit. Hornbills and turacos were rarely encountered among the cultivated oil palms but mostly observed in the HCV areas. The turacos were most abundant at the Extension II.

Counts at overnight communal roosts.

African Grey parrots began arriving at overnight roost sites around 5:00 pm, forming groups of various sizes. These groups often perched on trees at a distance of more than 200m from the roost tree. By 7:00 pm, they typically moved towards the roost tree in groups exceeding 50 individuals. Throughout the year, the number of parrots using the roost site fluctuated, ranging from 455 to 921 individuals. Specific counts for August 2022, November 2022, January 2023, and May 2023 were approximately 464, 455, 710, and 921 individuals, respectively (Figure 3). There are multiple possible explanation for the observed variations in numbers using the roost. These include natural seasonal changes in the distribution and behavior of African Grey parrots which means parrots overnight in other locations, possibly influenced by local food availability and the breeding cycle. Alternatively, these fluctuations may reflect seasonal changes in the size of the population, with peaks occurring immediately after the breeding season. The surge in parrot numbers during the latter part of the study period might also be linked to disturbances at Okomu National Park caused by increased logging activities nearby, which may have driven parrots out of heavily logged areas of forest. In comparison to estimates from March and July 2019, which ranged between 400 and

450 individuals, the counts obtained during the surveys were generally higher. It is noteworthy that the earlier estimates in 2019 were made without the use of night vision binoculars. During that period, counts were also conducted at an overnight communal roost site near Araukuah Stream in Okomu National Park for the same months, estimating that between 18 and 54 parrots used that site. Figure 4 illustrates the roosting African Grey parrots within Okomu Main Estate, observed with the aid of night vision binoculars. The roosting site at the Main Estate of the plantation is the largest aggregation of overnight roosting African Grey parrots currently known in West Africa. This site is therefore of considerable conservation importance and should be managed accordingly to minimise disturbance, noting that the site is already designated as HCV.

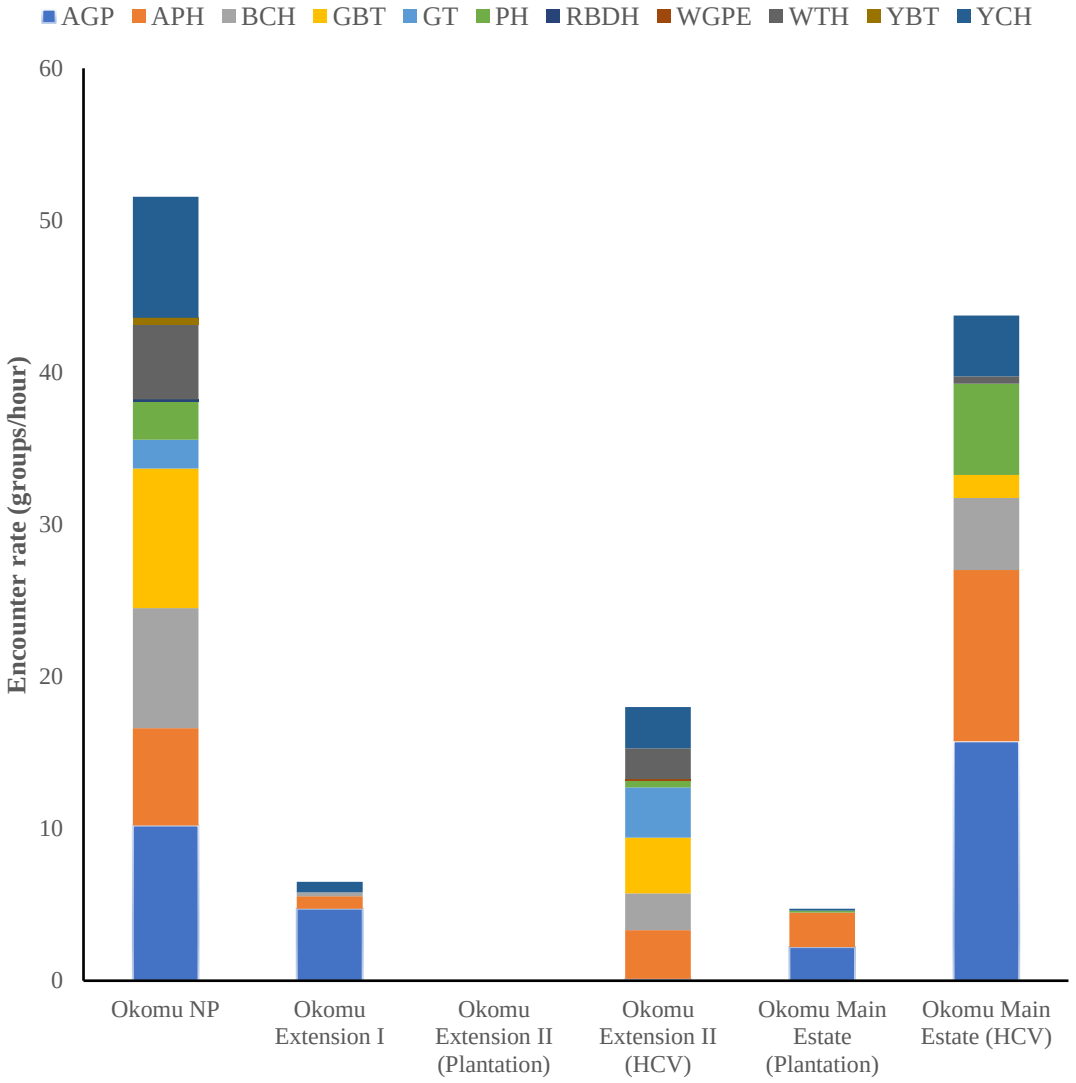

Figure 2: Encounter rates of the species across the study area. AGP - African Grey Parrot; APH – African Pied Hornbill; BCH – Black-casqued Hornbill; GBT – Great Blue Turaco; GT – Green Turaco; PH – Piping Hornbill; RBDH – Red-billed Dwarf Hornbill; WGPE - Western Grey Plantain-eater; WTH - White-thighed Hornbill; YBT - Yellow-billed Turaco; YCH - Yellow-casqued Hornbill

The results showed that two species including African Grey Parrot and Yellow-casqued Hornbill which are globally threatened according to International Union for Conservation of Nature (IUCN) were encountered insignificant populations across the landscapes. African Grey Parrots are classified as Endangered while Yellow-casqued Hornbill are Vulnerable on the IUCN Red List of Threatened Species. Populations of both species are declining in the wild. African Grey Parrot populations are declining due to threats including habitat disturbance (timber logging both at inland and mangrove/coastal forest ecosystems, agricultural expansion) and trapping for pet trade (Birdlife International, 2021). Yellow-casqued Hornbill are declining due to hunting, habitat fragmentation caused by logging and agricultural encroachment leading to inhibited movement of individuals between seasonal food sources, and population isolation (BirdLife International, 2016). These species were observed to forage, roost, and breed in the National Park and HCVs within plantations highlighting the importance of careful stewardship of these landscapes. While the Main Estate of the plantation sustains high levels of activity of African Grey Parrots due tothe presence of the overnight communal roost site, the HCV areas of the plantations (especially Extension II) are also important to a wide diversity of large frugivorous birds the species encountered during the surveys.

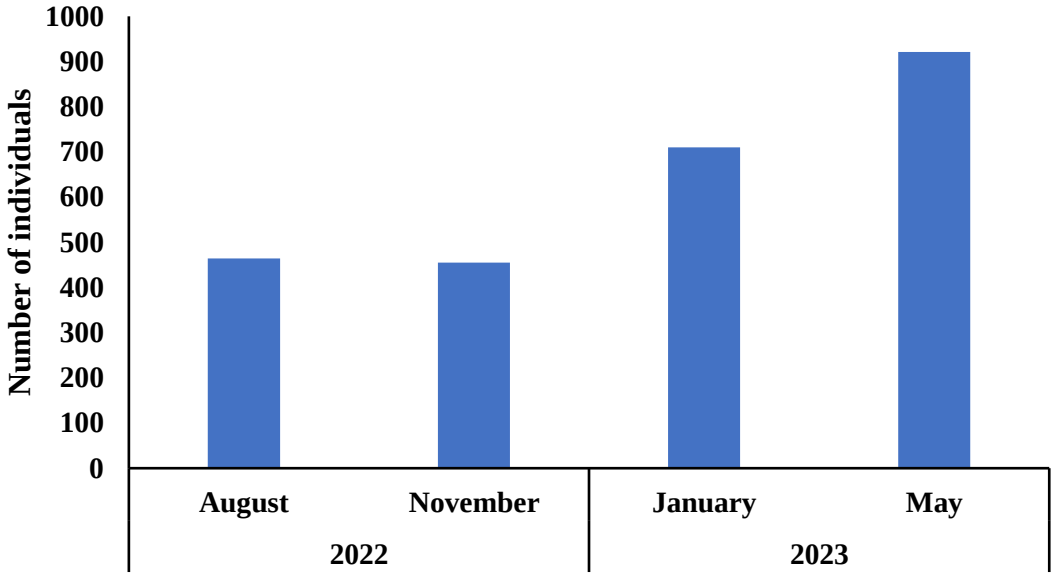

Figure 3: Numbers of African Grey parrots counted at the overnight communal roost site within Okomu Main Estate.

Figure 4: Composite of images taken with night vision binoculars at a communal overnight roosting site within Okomu National Park.

Footage of African Grey parrots roosting overnight at Main Estate of Okomu Oil Palm PLC is available at the following link https://drive.google.com/file/d/15jKsAXZQ2BE3vjJYGhVGxJ0YHB-Ca66T/view?usp=sharing

Conservation implications and Recommendations

The data indicate that the Okomu landscape (National Park, plantations, and surrounding areas) supports a globally important population of African Grey parrots likely in excess of a thousand parrots. The forest areas both inside (HCVs) and outside of the plantations provide important resources for parrots, turacos, and hornbills. Although palm fruit are often considered an important food for African Grey parrots, parrots and other frugivorous birds were not found to frequently feed on cultivated oil palms. Rather food resources within forest patches in designated HCVs were most important for parrots and other frugivorous birds.

Based on the findings of this research we make the following recommendations:

1. Periodic and systematic monitoring of the large frugivorous birds should take place, this should particularly focus at Okomu National Park, and Main Estate and Extension II adopting the protocol already established, including both line transect surveys and use of night vision binoculars for counting roosting parrots. Training could be offered to locally based staff in the use of night vision binoculars for monitoring parrots at roosts to ensure accurate and repeatable estimates.
2. Protect and where necessary restore forest habitat within designated HCVs, with a specific focus at Extension II where forest in HCVs was observed to be degraded.
3. Prevent intrusions by hunters in the HCV at Extension II where spent gun cartridges were observed.
4. The communal overnight roosting area within Okomu Main estate should be protected and the entire landscape guarded against possible threat of trapping.
5. Forest patches/HCVs within plantations should be protected. Although, these patches are too small to adequately support and sustain populations of large frugivores alone they nevertheless provide important resources for threatened species within the broader landscape and their importance should be recognised.

Acknowledgements

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References

BirdLife International (2021). Psittacus erithacus. The IUCN Red List of Threatened Species 2021:e.T22724813A154428817. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T22724813A154428817.en

BirdLife International (2016). Ceratogymna elata. The IUCN Red List of Threatened Species 2016: e.T22682627A92954374. http://dx.doi.org/10.2305/IUCN.UK.2016-3.RLTS.T22682627A92954374.en

Borrow, N. and Demey, R. (2001). A Guide to the Birds of Western Africa. Princeton University press, New Jersey

Dueker, S., Kupsch, D., Waltert, M., Bobo, S. K. and Heymann, E. W. (2019). Congo Grey Parrot Psittacus erithacus densities in oil palm plantation, agroforestry mosaic and protected forest in Southwest Cameroon. Bird Conservation International, doi:10.1017/S0959270919000194

Edwards, D. P.; Fisher, B. and Wilcove, D. S. (2012). High conservation value or high confusion value? Sustainable agriculture and biodiversity conservation in the tropics. Conservation Letters, 5(1): 20-27.

Miller-Rushing, A. J.; Primack, R. B.; Devictor, V.; Corlett, R. T.; Cumming, G. S.; Loyola, R.; Maas, B. and Pejchar, L (2019). How does habitat fragmentation affect biodiversity? A controversial question at the core of conservation biology. Biological Conservation, 232: 271-273.

Senior, M. J. M.; Brown, E.; Villalpando, P. and Hill, J K (2015). Increasing the scientific evidence base in the 'High Conservation Value' (HCV) approach for biodiversity conservation in managed tropical landscapes. Conservation Letters, 8(5): 361-367.

Weerakoon, D. (2021). Biodiversity in Oil Palm Plantations, In: Myths and Truths of Oil Palm. A study on impact and opportunities of sustainable oil palm cultivation in Asia. Solidaridad Network Asia Limited, Hong Kong, pp 37-53

Annex 1: Relative abundance of large frugivorous birds encountered across the respective sites.

Time of visits		Okomu National Park		Okomu Extension I		Okomu Extension II Plantation		Okomu Extension II (HC/Forest Patches)		Okomu Main Estate (Plantation)		Okomu Main Estate (HCV/Forest Patch)	
	Spp. codes	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered
First visit (August, 2022)	AGP	5	7	5	8	-	-	-	-	2	4	**No HCV survey conducted**	
	APH	5	10	1	1	-	-	3	3	1	1		
	BCH	4	7	-	-	-	-	1	1	-	-		
	GBT	7	15	-	-	-	-	5	6	-	-		
	GT	1	1	-	-	-	-	3	3	-	-		
	PH	-	-	-	-	-	-	-	-	-	-		
	RBDH	-	-	-	-	-	-	-	-	-	-		
	WGPE	-	-	-	-	-	-	-	-	-	-		
	WTH	4	5	-	-	-	-	3	4	-	-		
	YBT	1	1	-	-	-	-	-	-	-	-		
	YCH	11	16	1	1	-	-	3	5	1	1		
Second visit (November, 2022)	AGP	15	30	2	4	-	-	1	2	2	3	19	49
	APH	8	12	1	2	-	-	6	8	3	3	15	18
	BCH	6	10	-	-	-	-	3	7	-	-	7	11
	GBT	11	20	-	-	-	-	3	4	-	-	-	-
	GT	2	2	-	-	-	-	3	4	-	-	-	-
	PH	4	9	-	-	-	-	1	2	-	-	6	8
	RBDH	-	-	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	-	-	-	-	-	-
	WTH	7	12	-	-	-	-	3	5	-	-	2	2
	YBT	0	0	-	-	-	-	-	-	-	-	-	-
	YCH	9	13	1	1	-	-	4	5	-	-	8	13

AGP - African Grey Parrot; APH – African Pied Hornbill; BCH – Black-casqued Hornbill; GBT – Great Blue Turaco; GT – Green Turaco; PH – Piping Hornbill; RBDH – Red-billed Dwarf Hornbill; WGPE - Western Grey Plantain-eater; WTH - White-thighed Hornbill; YBT - Yellow-billed Turaco; YCH - Yellow-casqued Hornbill. - = Not encountered.

Table 1 contd

Time of visits		Okomu National Park		Okomu Extension I		Okomu Extension II Plantation		Okomu Extension II (HCV)		Okomu Main Estate (Plantation)		Okomu Main Estate (HCV)	
	Spp. codes	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered	Group encounter	Individual encountered
Third visit (January, 2023)	AGP	12	28	6	10	-	-	-	-	2	4	17	42
	APH	7	12	1	1	-	-	1	2	1	2	15	24
	BCH	9	16	-	-	-	-	2	4	-	-	10	15
	GBT	10	15	-	-	-	-	3	4	-	-	4	4
	GT	4	4	-	-	-	-	3	4	-	-	-	-
	PH	3	4	-	-	-	-	1	3	1	1	14	27
	RBDH	-	-	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	1	1	-	-	-	-
	WTH	5	5	-	-	-	-	3	4	-	-	-	-
	YBT	1	1	-	-	-	-	-	-	-	-	-	-
	YCH	7	11	-	-	-	-	2	3	-	-	5	7
Fourth visit (May, 2023)	AGP	9	14	6	9	-	-	-	-	3	8	27	70
	APH	6	8	1	1	-	-	3	4	4	4	15	19
	BCH	13	17	1	1	-	-	5	6	-	-	2	3
	GBT	9	11	-	-	-	-	5	9	-	-	2	2
	GT	2	2	-	-	-	-	5	6	-	-	-	-
	PH	3	3	-	-	-	-	-	-	-	-	4	4
	RBDH	1	1	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	-	-	-	-	-	-
	WTH	4	4	-	-	-	-	1	1	-	-	-	-
	YBT	0	0	-	-	-	-	-	-	-	-	-	-
	YCH	6	7	1	1	-	-	3	4	-	-	3	3

AGP - African Grey Parrot; APH – African Pied Hornbill; BCH – Black-casqued Hornbill; GBT – Great Blue Turaco; GT – Green Turaco; PH – Piping Hornbill; RBDH – Red-billed Dwarf Hornbill; WGPE - Western Grey Plantain-eater; WTH - White-thighed Hornbill; YBT - Yellow-billed Turaco; YCH - Yellow-casqued Hornbill. - = Not encountered.

Annex 2: Summary of the encounter rate for large frugivorous birds across the National Park, Plantations and Associated High Conservation Value Areas

		Okomu National Park		Okomu Extension I		Okomu Extension II (Plantation)		Okomu Extension II (HCV)		Okomu Main Estate (Plantation)		Okomu Main Estate (HCV)	
	Spp. code	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate
First visit (August, 2022)	AGP	1.43	2.10	1.72	2.71	-	-	-	-	0.51	1.31	**No HCV survey conducted.**	
	APH	1.33	2.76	0.24	0.24	-	-	0.71	0.71	0.24	0.24		
	BCH	1.14	2.00	-	-	-	-	0.14	0.14	-	-		
	GBT	1.90	4.19	-	-	-	-	1.29	1.71	-	-		
	GT	0.19	0.19	-	-	-	-	0.71	0.71	-	-		
	PH	-	-	-	-	-	-	-	-	-	-		
	RBDH	-	-	-	-	-	-	-	-	-	-		
	WGPE	-	-	-	-	-	-	-	-	-	-		
	WTH	1.05	1.52	-	-	-	-	0.71	1.00	-	-		
	YBT	0.19	0.19	-	-	-	-	-	-	-	-		
	YCH	3.05	4.57	0.05	0.05	-	-	0.86	1.43	0.14	0.14		
Second visit (November, 2022)	AGP	5.38	12.21	0.67	1.19	-	-	0.14	0.43	0.57	0.86	5.43	14.00
	APH	3.02	4.26	0.38	0.48	-	-	1.71	2.29	0.86	0.86	4.29	5.14
	BCH	2.31	4.10	-	-	-	-	0.71	1.86	-	-	2.00	3.14
	GBT	3.21	5.71	-	-	-	-	0.71	1.00	-	-	-	-
	GT	0.88	0.95	-	-	-	-	0.86	1.00	-	-	-	-
	PH	1.31	2.52	-	-	-	-	0.14	0.43	-	-	1.71	2.29
	RBDH	-	-	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	-	-	-	-	-	-
	WTH	2.36	3.71	-	-	-	-	0.71	1.29	-	-	0.57	0.57
	YBT	0.00	0.00	-	-	-	-	-	-	-	-	-	-
	YCH	3.00	4.45	0.10	0.38	-	-	1.00	1.29	-	-	2.29	3.71

Table 2 contd.

Time of visits		Okomu National Park		Okomu Extension I		Okomu Extension II (Plantation)		Okomu Extension II (HCV)		Okomu Main Estate (Plantation)		Okomu Main Estate (HCV)	
	Spp. code	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate	Group encounter rate	Individual encounter rate
Third visit (January, 2023)	AGP	3.43	8.00	1.76	2.86	-	-	-	-	0.57	1.00	4.86	12.00
	APH	2.00	3.43	0.17	0.17	-	-	0.29	0.43	0.36	0.64	4.29	6.86
	BCH	2.43	4.57	-	-	-	-	0.57	1.00	-	-	2.86	4.29
	GBT	2.71	4.14	-	-	-	-	0.76	1.14	-	-	1.14	1.14
	GT	1.00	1.14	-	-	-	-	0.86	1.14	-	-	-	-
	PH	0.86	1.00	-	-	-	-	0.38	0.86	0.14	0.14	4.00	7.71
	RBDH	-	-	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	0.10	0.10	-	-	-	-
	WTH	1.43	1.43	-	-	-	-	0.71	1.00	-	-	-	-
	YBT	0.25	0.25	-	-	-	-	-	-	-	-	-	-
	YCH	2.00	3.14	-	-	-	-	0.48	0.86	-	-	1.43	2.00
Fourth visit (May, 2023)	AGP	3.05	4.51	1.81	2.77	-	-	-	-	0.95	2.29	7.71	20.00
	APH	1.75	2.51	0.17	0.23	-	-	0.95	1.05	1.14	1.24	4.29	5.43
	BCH	4.19	5.24	0.06	0.06	-	-	1.33	1.71	-	-	0.57	0.86
	GBT	2.92	3.30	-	-	-	-	1.43	2.48	-	-	0.57	0.57
	GT	0.73	1.05	-	-	-	-	1.33	1.81	-	-	-	-
	PH	1.14	1.24	-	-	-	-	-	-	-	-	1.14	1.14
	RBDH	0.19	0.19	-	-	-	-	-	-	-	-	-	-
	WGPE	-	-	-	-	-	-	-	-	-	-	-	-
	WTH	1.17	1.27	-	-	-	-	0.19	0.29	-	-	-	-
	YBT	0.10	0.10	-	-	-	-	-	-	-	-	-	-
	YCH	1.62	1.90	0.23	0.23	-	-	0.76	1.24	-	-	0.86	0.86