Raptors in Yankari Game Reserve and surrounding unprotected area, Nigeria

Article *in* Malimbus · February 2014

CITATIONS
0

READS
911

6 authors, including:

Talatu Tende
A. P. Leventis Ornithological Research Institute
16 PUBLICATIONS **83** CITATIONS
SEE PROFILE

Taiwo C. Omotoriogun
University of Oslo
24 PUBLICATIONS **65** CITATIONS
SEE PROFILE

Ulf Ottosson
Lund University
126 PUBLICATIONS **2,119** CITATIONS
SEE PROFILE

Georgina Samuel Mwansat
University of Jos
47 PUBLICATIONS **83** CITATIONS
SEE PROFILE

Some of the authors of this publication are also working on these related projects:

The Birds of Elizade University Forest and Surrounding Environment: A Step to the Conservation of Elizade Ecosystem View project

Nigeria Bird Atlas Project View project

Raptors in Yankari Game Reserve and surrounding unprotected area, Nigeria

by J.D. ONOJA[1,2], T. TENDE[1,3], T.C. OMOTORIOGUN[1,4], U. OTTOSSON[1], S.A. MANU[1,2] & G.S. MWANSAT[2]

[1]A.P. Leventis Ornithological Research Institute, PO Box 13404, Jos Plateau State, Nigeria
[2]Dept of Zoology, University of Jos, PMB 2084, Jos, Nigeria <oj_daniels@yahoo.com>
[3]Dept of Animal Ecology, Lund University, Sweden
[4]National Centre for Biosystematics, Natural History Museum, Univ. of Oslo, Norway

Received 15 May 2012; revised 27 February 2014.

Summary

A recent survey to estimate the population of raptors in and around Yankari Game Reserve revealed that the reserve still holds a number of raptor species also found in other reserves in West Africa. In total, 886 raptors of 37 species were recorded in the gallery forest and savanna habitats of the reserve, while 155 individuals in 18 species were encountered outside of the reserve. The number of raptors per km of transect in the unprotected area was lower than in the reserve, despite transect speed being slower and raptor detectability probably higher in the unprotected area. Most of the species encountered during surveys were medium-sized raptors. Juvenile raptors were seen only within the reserve, and adults of large species were rare outside it. Vultures seem to have declined since 2008, with two species having apparently been lost from the area.

Résumé

Les rapaces dans la Réserve Naturelle de Yankari et la zone adjacente non protégée, Nigeria. Une étude récente visant à estimer la population de rapaces dans et autour de la Réserve Naturelle de Yankari a révélé que la réserve contient encore nombre d'espèces de rapaces également présentes dans d'autres réserves d'Afrique de l'Ouest. Au total, 886 rapaces de 37 espèces ont été observés dans les habitats de forêt galerie et de savane, tandis que 155 individus de 14 espèces ont été rencontrés hors de la réserve. Le nombre de rapaces par km de transect dans la zone non protégée était inférieur à celui de la réserve, bien que la vitesse de parcours des transects ait été plus lente et la possibilité de découverte de rapaces probablement plus forte dans la zone non protégée. La plupart des espèces rencontrées au cours des enquêtes

ont été des rapaces de taille moyenne. Des rapaces juvéniles n'ont été vus qu'à l'intérieur de la réserve et les adultes d'espèces de grande taille étaient rares à l'extérieur. Les vautours paraissent être moins nombreux depuis 2008, avec deux espèces ayant apparemment disparu de la zone.

Introduction

Diurnal birds of prey are good indicators of changes in ecosystems and of impacts of human activity, owing to their sensitivity to environmental contamination, persecution and disturbance (Newton 1979). Most species of raptor are conspicuous and they feed on a broad array of invertebrates and vertebrates across all natural and artificial habitats (Thiollay 2006). Today, the dramatic increase in human pressure, deforestation and general decrease in tree cover, overgrazing and erosion, pesticide use, over-hunting and fishing, and sometimes direct persecution of predators, all impact negatively on raptor population (Thiollay 2006). To counter widespread population declines, many attempts have been made in recent years to increase raptor numbers, either by the management of the birds themselves or of their habitat and food sources (Newton 1979). The positive effects on these birds are revealed in nature reserves, where threats to them are minimized. For example in West Africa an estimate of the mean abundance index of raptors between protected and unprotected areas has shown a 30 % decline of raptors in protected areas compared with a 67 % decline in unprotected areas (Thiollay 2006, 2007b). In the savannas of West Africa, 40 breeding raptor species and 19 Palaearctic migrant species have been recorded (Borrow & Demey 2001, Thiollay 2007a). Brown (1970) observed that little is known about the actual numbers of the various species, and without knowing this it is difficult to determine the real effect of conservation effort.

A recent survey in Yankari Game Reserve, Bauchi State, Nigeria, revealed a decline in the population of vultures (Tende & Ottosson 2008). However, data on the population status of other raptor species is lacking. The aim of these surveys was therefore to estimate the abundance, diversity and distribution of raptors in Yankari Game Reserve and surrounding unprotected areas, in a bid to establish a baseline for conservation for this group of birds.

Methods

Study site

The survey was carried out in and around the Yankari Game Reserve (9°50′N, 10°30′E), Bauchi State in the east-central part of Nigeria. The reserve has a total area of 2244 km^2 and is bisected by the River Gaji. It lies within the Sudan Savanna Zone (Geerling 1973) and receives an average rainfall of *c.* 1000 mm per year, between

April and October (Crick & Marshall 1981). The vegetation includes swampy flood plain bordered by patches of forest, gallery forest, riparian forest and woodland savanna (Crick & Marshall 1981, Ezealor 2002). In seasonally flooded "fadamas", *Ficus* spp. and *Mitragyna* sp. are the dominant trees, while tangles of *Mimosa pigra* dominate the shrub stratum. The reserve was established as a Game Preservation Unit (GPU) of the Northern Region of Nigeria in January 1956 (Sikes 1964), and from its inception has been traversed by roads, by which border zone communities reach and utilize renewable natural resources within the reserve. Presently, twelve communities around the reserve have roads leading to its centre at Wikki Camp (9°45′N, 10°30′E. About 337 species of birds have been recorded (Ezealor 2002), of which 130 are resident, 50 are Palaearctic migrants and the rest are intra-African migrants.

The unprotected area outside the reserve is mainly farmland with scattered trees and hedges of *Guerra senegalensis*. Crops grown in these farmlands were mostly groundnut *Arachis hypogaea*, beans *Phaseolus vulgaris*, guinea corn *Sorghum bicolor*, millet *Pennisetum glaucum* and rice *Oryza sativa*.

Survey Design

The survey within the reserve was carried out for eight weeks from 21 April to 28 June 2008. This period coincided with the beginning of the rainy season, with insignificant rainfall during the period of the survey. Twenty line-transects (Bibby *et al.* 2000) of an average length of 10 km were used to count raptors. A total distance of 1636 km was covered during this transect survey. Transects were along game viewing and anti-poaching patrol tracks, and chosen to cover both savanna and gallery forest habitats. The coordinates of the start and end of each transect were recorded. Surveys were carried out in the morning (6h30–13h00) and evening (15h00–18h00). Counts were made by two non-driving observers from a car moving at an average speed between 12 and 25 km/h (Fuller & Mosher 1981). All raptors flying, perched and heard were identified, counted and their locations recorded using a Garmin 760CSx global positioning system (GPS) receiver. For birds seen perched, their perpendicular distances from the transect were recorded using a Canon Laser Range Finder.

In addition, observations were made from five different vantage points with good views of the surroundings (Fig. 1). Each point was visited at least three times and one hour was spent at each point, between 12h00 and 13h00, *i.e.* at a time of day when raptors make use of thermals to soar. Using binoculars and a telescope, the surroundings were scanned for any raptors seen perched or flying. Efforts were made to avoid double counts of birds observed by noting the direction in which the last counted individual disappeared from sight and the flock size.

The unprotected area outside the reserve was surveyed between 23 May and 23 July 2009. A total of 33 transects, each measuring 10 km in length, was laid in the area surrounding the reserve. Counts were made by two non-driving observers from a car moving at an average speed of 10.5 km/h (slower than in the reserve because of the bumpy nature of the roads). All raptors seen perched or flying or heard were

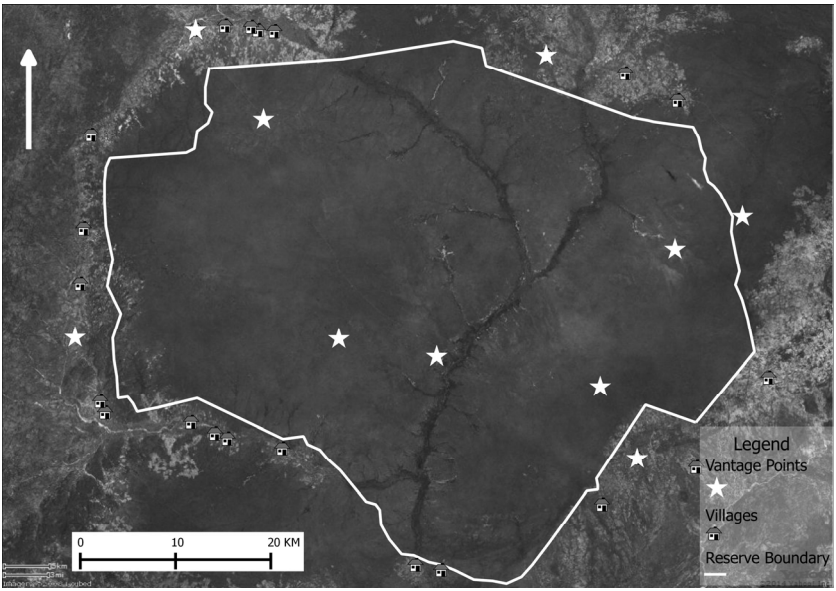

Figure 1. LandSat photograph of Yankari Game Reserve and surrounding unprotected area, showing observation vantage points.

identified and their location recorded. Surveys were carried out between 10h00 and 14h00, and all transects were visited once. The survey covered a total distance of 330 km. Five vantage points outside the reserve were used for observing raptors soaring or perched (Fig. 1).

Data Analysis

The surveys were designed to provide baseline data for each of the two areas and not primarily for comparison between them. Detectability, timing of survey periods and speed of the vehicle were all different in the two habitats. Detectability was probably higher in the unprotected area than in the reserve because of the more open nature of the unprotected area, and transect speed was slower there. This must be borne in mind when using these data for comparison between the two habitats.

Abundance on transects, of all raptors combined and of each raptor species, is expressed as encounter rate, in terms of the number of individuals encountered per 100 km of transect travelled and per h of transect time. Encounter rate during vantage point observations is expressed as number of raptors seen per h of observation. The encounter rates on transects were calculated as total number of individuals encountered over the total distance covered per month during the period of survey.

Results

In the reserve, 886 individual raptors of 37 species were recorded during the transects, combining forest and savanna (Table 1), of which 49 individuals (5.5 %) were classed as juveniles and sub-adults. In April, 170 raptors were seen over a total distance of 301.1 km covered (56 birds per 100 km), May had 418 raptors over 789.1 km (53 per 100 km), while June had 298 raptors over 545.3 km (55 per 100 km): there was no significant difference in encounter rate on transects between months ($\chi^2 = 0.0854$, df = 2, $P = 0.958$). The overall raptor encounter rates during transects in the reserve were 54 birds per 100 km (total 1635.6 km) or 5.5 birds per h (total 160.35 h), with higher overall encounter rate in the forest than in the savanna (Table 1). In the savanna, the Grasshopper Buzzard was the species with the highest encounter rate, with other common species including Dark Chanting-Goshawk, Grey Kestrel and Bateleur, while the Palmnut Vulture had the highest encounter rate for the gallery forest with other commonly encountered species there including Bateleur, African Fish-Eagle, Black Kite, Lizard Buzzard, Grey Kestrel and African Hawk-Eagle (Table 1). Encounter rates at vantage point observations in the reserve were higher than the per h results from transects, but because less time was spent on the former (total 17 h of observation), the results for each species are less informative and are not presented here; 126 raptors were counted during vantage point observations in the reserve, giving an overall encounter rate of 7.4 birds/h. During the ten weeks of fieldwork, the Secretary Bird *Sagittarius serpentarius* was sighted only once, in the reserve but outside the survey period on 21 April.

For the unprotected area, 155 individual raptors, of 18 species, were encountered during the transect survey. In May, 36 raptors were seen and a total distance of 70 km was covered (51 birds per 100 km), June had 105 raptors over 170 km (62 per 100 km), while July had 14 raptors over 90 km (16 per 100 km). There was a significant difference between months in the encounter rates of raptors during the transect survey ($\chi^2 = 26.84$, df = 2, $P < 0.0001$), largely because Grasshopper Buzzard was common in May and June but not recorded in July. The overall raptor encounter rate during transects in the unprotected area was 47 birds per 100 km (*c*. 330 km) and 4.5 birds per h (34.5 h of survey). The species with the highest encounter rate was Black Kite, while Grasshopper Buzzard and Fox Kestrel were also common (Table 1). African Swallow-tailed Kite, Bateleur, Brown Snake Eagle, Eurasian Marsh Harrier, Lanner and Lizard Buzzard were encountered only once each, the Eurasian Marsh Harrier in a rice field on 23 May. During vantage point observations outside the reserve, the encounter rate was 3.5 birds per h (26 birds over 7.5 h of observation).

Discussion

This survey shows that the Yankari Game Reserve still retains a considerable number of raptor species that normally occur in other nature reserves in West Africa (*cf.* Thiollay

Table 1. Transect counts of raptor species in savanna and gallery forest in the Yankari Game Reserve, and in the surrounding unprotected area.

	Savanna		Gallery		Unprotected	
	total count	n/100 km	total count	n/100 km	total count	n/100 km
Pandion haliaetus Osprey	-	-	2	0.34	-	-
Pernis apivorus Western Honey-Buzzard	2	0.19	2	0.34	-	-
Macheiramphus alcinus Bat Hawk	-	-	1	0.17	-	-
Elanus caeruleus Black-shouldered Kite	18	1.73	4	0.67	10	3.03
Chelictinia riocourii Swallow-Tailed Kite	-	-	-	-	1	0.30
Milvus migrans Black Kite	11	1.06	34	5.71	41	12.42
M. parasitus Yellow-billed Kite	2	0.19	2	0.34	-	-
Haliaeetus vocifer African Fish-Eagle	5	0.48	48	8.07	-	-
Gypohierax angolensis Palmnut Vulture	8	0.77	61	10.25	-	-
Necrosyrtes monachus Hooded Vulture	-	-	5	0.84	-	-
Gyps africanus African White-backed Vulture	1	0.10	13	2.35	-	-
Trigonoceps occipitalis White-headed Vulture	8	0.77	4	0.67	-	-
Circaetus gallicus Short-toed Snake-eagle	-	-	1	0.17	-	-
C. cinereus Brown Snake-eagle	7	0.67	8	1.34	1	0.30
C. cinerascens Western Banded Snake-Eagle	1	0.10	1	0.17	-	-
Terathopius ecaudatus Bateleur	36	3.46	49	8.23	1	0.30
Polyboroides typus African Harrier-Hawk	15	1.44	14	2.35	-	-
Circus macrourus Pallid Harrier	3	0.29	-	-	-	-
C. ranivorus African Marsh Harrier	1	0.10	-	-	-	-
C. aeruginosus Eurasian Marsh Harrier	-	-	-	-	1	0.30
Melierax metabates Dark Chanting-Goshawk	56	5.38	3	0.50	11	3.33
Accipiter badius Shikra	13	1.25	16	2.69	6	1.82
A. ovampensis Ovambo Sparrowhawk	-	-	2	0.34	-	-
Butastur rufipennis Grasshopper Buzzard	183	17.59	12	2.02	36	10.91
Kaupifalco monogrammicus Lizzard Buzzard	19	1.83	29	4.87	1	0.30
Buteo auguralis Red-necked Buzzard	7	0.67	1	0.17	11	3.33
Aquila rapax Tawny Eagle	3	0.29	4	0.67	-	-
A. wahlbergi Wahlberg's Eagle	1	0.10	3	0.50	2	0.61
Hieraaetus spilogaster African Hawk-Eagle	15	1.44	22	3.70	2	0.61
Lophaetus occipitalis Long-crested Eagle	1	0.10	3	0.50	4	1.21
Polemaetus bellicosus Martial Eagle	2	0.19	4	0.67	-	-
Falco alopex Fox Kestrel	3	0.29	--	--	18	5.45
F. ardosiaceus Grey Kestrel	40	3.84	25	4.20	5	1.52
F. chicquera Red-necked Falcon	5	0.48	7	1.18	3	0.91
F. vespertinus Red-footed Falcon	11	1.06	-	-	-	-
F. cuvierii African Hobby	4	0.38	7	1.18	-	-
F. biarmicus Lanner Falcon	4	0.38	2	0.34	1	0.30
Glaucidium perlatum Pearl-spotted Owlet	-	-	2	0.34	-	-
Totals	**485**	**46.6**	**391**	**65.9**	**155**	**47.0**

2006). However, only three species of vulture were seen during the survey, in contrast to the five species recorded by Tende & Ottosson (2008), who also found Lappet-faced Vulture *Torgos tracheliotos* and European Griffon *Gyps fulvus*. The population of vultures in the reserve has declined markedly as compared with earlier surveys (Dyer & Gartshore 1975, Crick & Marshall 1981). Similarly, in the Sudan Savanna zone of West Africa, Thiollay (2006) reported a decline of 97 % of the African White-backed Vulture in 30 years. Possible reasons for such declines may be poisoning and persecution, and Thiollay (2007a) suggested that habitat degradation was a major factor. Protected areas remain a haven for raptors and should be maintained as such. However, the decline of vulture populations observed in the reserve may be due to poisoning outside the protected area (Tende & Ottosson 2008).

Other large raptor species such as Martial Eagle, Long-crested Eagle, Tawny Eagle, African Hawk Eagle and Wahlberg's Eagle were recorded in the reserve, including juveniles of Bateleur, Palmnut Vulture, African Hawk-eagle and Martial Eagle, suggesting that it may be an important breeding ground for raptor species. During both vantage point observations and road transects outside the reserve, only adult birds were seen. It may be that the species recorded outside the reserve mostly breed within it and only use the unprotected area for hunting.

The single sighting of Secretary Bird contrasts with the situation in the 1970s, when Demeter (1977) suggested that the bird occurred regularly in the reserve in low numbers. However, this species has declined so much that it is not seen in Nigeria now outside protected areas and only rarely within them.

The species encountered most often outside the reserve were of medium size: Black Kite, Fox Kestrel, Grasshopper Buzzard (in May–June), Dark Chanting-Goshawk and Red-necked Buzzard. The Fox Kestrel was mostly found in an area west of the reserve, probably due to the rocky nature of the habitat there (*cf.* Brown *et al*. 1997). Among the larger raptors recorded in the unprotected area were Bateleur (seen once, soaring) and Long-crested Eagle (seen twice outside and twice soaring over the protected area). Larger raptors may not find the unprotected areas conducive because of inadequate food supply and nest sites due to the degraded nature of the habitat. African Swallow-tailed Kite was recorded once outside the reserve; this species has never been recorded within the reserve, either during this survey or previously. The largest raptor encountered regularly in open plains and farmlands was the Red-necked Buzzard. No vultures were encountered in the unprotected area, perhaps because of the severe persecution that vultures and other raptors have suffered (*e.g.* Rondeau & Thiollay 2004, Thiollay 2006). When seen, vultures were either soaring very high or within the reserve.

There was little difference in the number of birds recorded between months probably because most of the species recorded are residents or have resident populations. In the case of Grasshopper Buzzard, not recorded in July during the survey outside the reserve, nor within it that month (casual observations), it may have migrated northwards to breed then (Brown *et al.* 1997).

The average number of raptors observed in the unprotected area was 0.48 birds/km, lower than in the protected area (0.75), despite the transect speed being slower and raptor detectability probably higher outside the reserve. It is also lower than in other studies (1.63, Thiollay 2006; 0.58, Tende & Ottosson 2008). The lower rate outside the reserve could be partly due to the surveys there having been carried out later than those in the reserve, so that Palaearctic migrants such as Honey-Buzzard, harriers and Red-footed Falcon would have departed by the later part of the unprotected area survey. However, higher encounter rates were found outside the reserve for the migrant Black Kite and, overall, the proportion of species encountered that were Palaearctic migrants was small, so that this factor could not account for the generally lower encounter rate in the unprotected area. Rather, other factors such as pesticide use on farmlands may have reduced the number of insects and rodents in unprotected areas, making them less suitable for raptors as compared with protected areas. Overgrazing and cutting of trees and other vegetation for farming have also resulted in low quality habitat in the unprotected area, and the area is highly disturbed by people. In unprotected areas there may also be direct persecution of raptors. People sometimes kill them for meat or to prevent them from preying on their domestic chickens (Tende & Ottosson 2008). These reasons may be the cause of the decline of raptors, especially the large ones, while the medium-sized species that can survive on small prey like insects, scorpions and rodents are relatively less affected.

Although the reserve's population of vultures and other raptor species has declined, it still has the potential to sustain the populations of raptors left, its habitat heterogeneity making it a good haven for many species of raptors. The reserve also has great potential as an ecotourism destination and a base for biological research. Therefore, it is recommended that efforts should be made to enlighten the surrounding communities on the need to stop the persecution of raptors. A raptor monitoring programme also needs to be put in place to detect changes both within and outside the reserve.

Acknowledgments

This work for the protected area was generously funded by the Leventis Foundation. The authors are deeply grateful to the British Ornithologists' Union for providing additional funds and to the Swedish Ornithological Society for support. We appreciate Haladu Idi's support in the field. This is contribution no. 74 from the A.P. Leventis Ornithological Research Institute, to which we are grateful for logistical support.

References

BIBBY, C.J., BURGESS, N.D., HILL, D.A. & MUSTOE, S.H. (2000) *Bird Census Techniques*. Academic Press, London.

BORROW, N. & DEMEY, R. (2001) *Birds of Western Africa*: Christopher Helm, London.

BROWN, L., URBAN, E.K. & NEWMAN, K. (1997) *The Birds of Africa*, vol. 2. Academic Press, London.

BROWN, L. (1970) *African Birds of Prey*. Collins, London.

CRICK, H.Q.P. & MARSHALL, P.J. (1981). The birds of Yankari Game Reserve, Nigeria: their abundance and seasonal occurrence. *Malimbus* 3: 103–113.

DEMETER, A.A. (1977) Additions to local avifaunas: Yankari. *Bull. Niger. Orn. Soc.* 13: 81.

DYER, M. & GARTSHORE, M.E. (1975) Birds of Yankari Game Reserve, Nigeria. *Bull. Niger. Orn. Soc.* 11: 77–84.

EZEALOR A.U. (ed.) (2002) *Critical Sites for Biodiversity Conservation in Nigeria*. Nigerian Conservation Foundation, Lagos.

FULLER, M.R., & MOSHER, J.A. (1981) Methods of detecting and counting raptors: a review. *Stud. avian Biol.* 6: 235–246.

GEERLING, C. (1973) *The Vegetation of Yankari Game Reserve, its Utilization and Condition.* Bulletin 3, Dept of Forestry, University of Ibadan, Ibadan.

NEWTON, I. (1979) *Population Ecology of Raptors*. Poyser, Berkhamsted.

RONDEAU, G. & THIOLLAY, J.M. (2004) West African vulture decline. *Vulture News* 51: 13–33.

SIKES, S.K. (1964) A game survey of Yankari Game Reserve, Northern Nigeria. *Niger. Field* 36: 171–180.

TENDE, T. & OTTOSSON, U**.** (2008) The current status of vultures in Yankari. *Vulture News* 59: 7–12.

THIOLLAY, J.M. (2006) The decline of raptors in West Africa: long-term assessment and the role of protected areas. *Ibis* 148: 240–254.

THIOLLAY, J.M. (2007a) Raptor population decline in West Africa. *Ostrich* 78: 405–413.

THIOLLAY, J.M. (2007b) Raptor declines in West Africa: comparisons between protected, buffer and cultivated areas. *Oryx* 41: 1–8.