

Observations of birds of prey in Eastern Nimba Nature Reserve, Liberia between 2015 and 2017

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Abstract Distribution and biology of birds of prey species have been well-documented in most parts of the globe. Knowledge gaps are continuously shrinking due to more research, new technologies and increasing possibilities to reach remote areas. However, there are still some regions where data on birds of prey are scarce due to various reasons. Some parts of West Africa are such places, mostly because civil wars and the outbreak of Ebola prevented any kind of research. In the period 2015–2017, a butterfly research project in Nimba Mountains, Liberia offered opportunity to collect data also on birds of prey species. This article aims to provide a comprehensive list of birds of prey species in the area and compare it to other available historic and recent lists. In the frame of the project, 20 species were recorded. The results of comparing historic and recent records show that species of dry open habitats appeared and even settled in Nimba Mountains’ predominantly rainforest habitat. That suggests a habitat shift likely due to both climate change and human land transformation activities.

Keywords: Liberia, Nimba Mountains, birds of prey, Eastern Nimba Nature Reserve

Összefoglalás A ragadozómadár-fajok elterjedése és biológiája a Föld nagy részén már jól dokumentált. A kutatásoknak, új technikáknak és a távoli területek egyre egyszerűbb elérhetőségének köszönhetően folyamatosan nő az ismeretanyag. Vannak azonban olyan területek, ahonnan különböző okok miatt még kevés adatunk van a ragadozómadarakról. Nyugat-Afrika egyes vidékei ilyen területek, mivel a polgárháborúk és az Ebola járvány kitérése megakadályozták a kutatásokat. 2015–2017 között egy – a libériai Nimba-hegységben zajló – lepkékre irányuló kutatás lehetővé tette, hogy a ragadozómadár-fajokról is gyűjtsünk információkat. Jelen cikk célja, hogy egy átfogó képet adjon a területen előforduló ragadozómadár-fajokról és összehasonlítsa a korábbi és recens fajlistákat. A projektben összesen húsz fajt figyeltünk meg. A korábbi és jelen adatsorok összehasonlítása azt mutatja, hogy a Nimba-hegység elsődlegesen esőerdei élőhelyein megjelentek, sőt meg is telepedtek a száraz, nyílt területeket kedvelő fajok. Ez valószínűleg az élőhelyek átalakulását jelzi, amelynek okai feltehetően az éghajlatváltozás és az ember tájtalakító tevékenysége.

Kulcsszavak: Libéria, Nimba-hegység, ragadozómadár, Kelet-Nimba Természetvédelmi Terület

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Introduction

Despite the continuous development of technologies and increasing accessibility of remote places by researchers and tourists, there are still places to be discovered on Earth from biodiversity point of view. Reasons for lack of information vary from unsafe travelling to uninterest resulting from low cost-benefit ratio in scientific terms. Those factors, however, are also in constant change and blank areas continue to disappear from the world map.

West Africa, and civil war-torn Liberia within, is one of those regions, where there is still a lot to discover. The country hosts unique flora and fauna with endemic species due its geology and climate, as well as it has preserved relatively large areas of intact primary rain forests. The rich biodiversity of Liberia is an invaluable asset and a natural heritage that needs to be preserved for future generations. The fact that until 2010 three new butterfly species were discovered and four more have been described since then, only in Nimba region (Sáfián pers. comm.), shows the richness and justifies further research.

Some factors, however, limit the possibilities for research and conservation. The second (and last) Liberian civil war ended in 2003, but social and economic recovery of this West African country has been rather slow. The infrastructure was destroyed almost entirely by the wars, which had and still has an impact on society and the economy that affects national financial resources for research and conservation. As for the most popular and well researched taxon, the birds, for example, Liberia is one of the least researched countries in West Africa along with Bissau-Guinea, Mali and Togo (Freeman & Peterson 2019). Therefore, any form of international support for documenting and conserving the unique flora and fauna of Liberia is essential.

Establishing Eastern Nimba Nature Reserve (ENNR) was a step in that direction. Nimba Mountain (*Figure 1*) with its high-quality iron ore stretches from north to south: the southern part is in Liberia and the northern part is shared between Guinea and Ivory Coast. Vegetation cover on Nimba is Guinean Moist Forest and it includes lowland rainforest and savanna woodland. The vegetation merges into lowland forest on the eastern side of the mountains. At higher elevations (about 850 m asl), dense cloud cover is not uncommon resulting in a higher annual rainfall. Cloud (gallery) forests of that moister areas at about 1,000 m host pure stands of the tree-fern *Cyathea cylindrica*. *Garcinia polyantha* dominates the montane forest at even higher elevations (about 1,200 m). The dominant species of the gallery forest are *Parinari excelsa*, primary forest by *Triplochiton scleroxylon*, *Chlorophora regia*, *Morus mesozygia* etc. At lower elevation, drier mid-altitude forests consist of *Triplochiton scleroxylon*, *Piptadeniastrum africanum* and *Parkia bicolor* (Forestry Development Authority 2014). Nimba Mountains host several vertebrate endemics to the West African region like e.g. the Nimba Flycatcher (*Melaenornis annamarulae*), the Rufous Fishing Owl (*Scotopelia ussheri*) or the Nimba Otter Shrew (*Micropotamogale lamottei*). The northern part of Nimba range has been subject to the strictest nature conservation regulations in Guinea and Ivory Coast for decades.

The Liberian Nimba Mountains have a history of iron ore mining dated back to the 1960s, when the Liberian-American-Swedish Mineral Company (LAMCO) started to exploit that natural resource. Civil wars interrupted mining, but the Liberian government

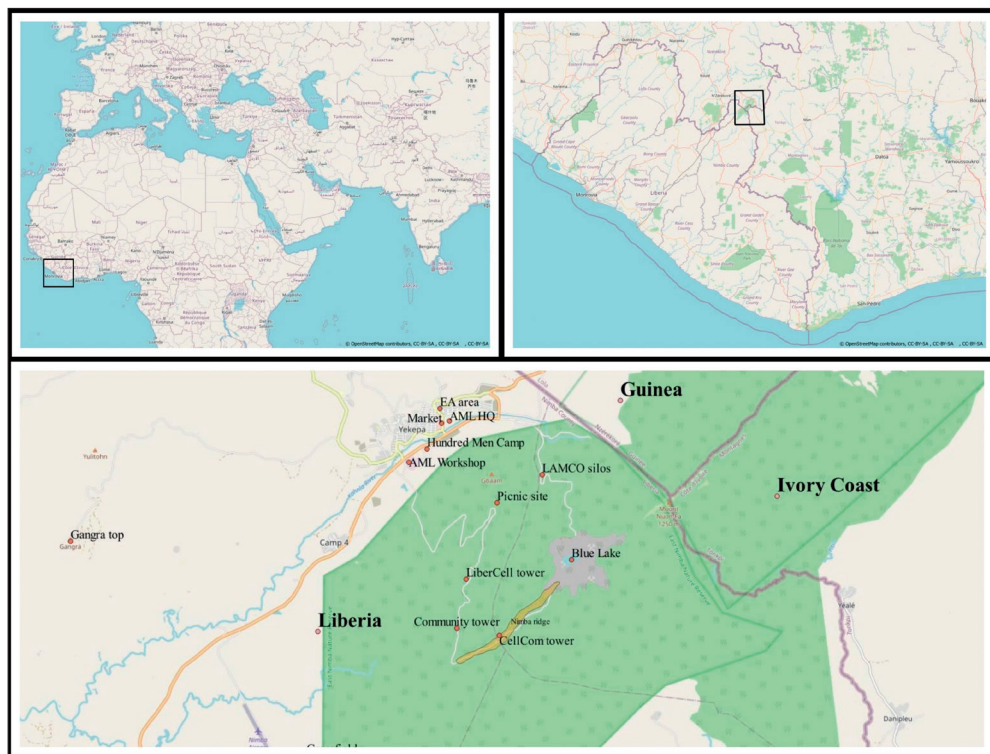


Figure 1. Location of the project area

1. ábra A projektterület földrajzi elhelyezkedése

sold the concession again after war to ArcelorMittal Liberia Limited (AM). According to the deal AM contributes to nature conservation through supporting basic research and the establishment of ENNR.

One of the AM supported research projects was focusing on the African Giant Swallowtail (*Papilio antimachus*), the largest butterfly in Africa. The author of recent paper visited Nimba region in the frame of that project. Besides the butterfly work, he had the chance to collect information on the local avifauna with special regard to birds of prey species. This article aims to summarize the results of those observations made on three tours to Nimba Mountains between 2015 and 2017, and it compares results against recent and historic data. The article contributes to filling the gap on the distribution and biology of birds of prey species in West Africa.

Materials and Methods

The observations were made on a total of 38 birding days in winter periods of 2015–2016, 2016–2017 and 2017–2018. That period refers to the dry season in Liberia when it rains only occasionally. A characteristic weather event of the dry season is the arrival of *harmattan*

wind from northeast. That hot and dry wind usually lasts for a few days and changes the landscape by sucking out the moisture from the vegetation. Observations were limited spatially to open areas of Nimba Mountains – mostly hilltops frequented by butterflies – and temporally to diurnal periods. Those limitations negatively affected the detectability of birds of prey species dwelling in dense forest habitats (Accipitridae) and nocturnal species (owls). In addition, timing allowed observing also wintering and migrating species.

The equipment consisted of 10×42 EL Swarovski binoculars and a Swarovski ATS 80 20×60 spotting scope. A Nikon COOLPIX P900 camera was used for photographing. Species identification was based on the guidebook *Birds of Western Africa* (Borrow & Demey 2014).

The main source of historic data was the book *The birds of Mount Nimba, Liberia* (Colston & Curry-Lindahl 1986). The book summarizes the bird observations from the period 1963–1982, when LAMCO ran a biological research station and collected data on the habitats and wildlife of the area. Another important source of information was the *Zoological assessment* part of the environmental and social impact assessment report for AM (Phalan 2010). Two digital databases are also referred to. One is the former African Raptor Databank (ARDB), which has been transformed and extended forming the Global Raptor Impact Network (GRIN, www.globalraptors.org). ARDB site collected historic and recent data specifically on the presence of birds of prey species across Africa. The other online application is eBird (www.ebird.org), which collects observations globally on every bird species. Data was retrieved from both online applications in October 2020.

Results and Discussion

During the four tours observations occurred on 38 days in total and 20 species were recorded on 106 occasions. Observed birds of prey species are listed in *Table 1*, while *Table 2* summarizes birds of prey species present historically or recently in the region, but not recorded during this project. A full description of the records can be found in *Table 3*.

Although monitoring raptor species was not the primary aim of the project and subsequently time effort was not maximized on raptor observation, the results give a comprehensive picture of the birds of prey fauna of the Liberian part of Nimba range. Beside the 20 observed species, other 16 birds of prey species (*Table 2*) have been recorded historically (Colston & Curry-Lindahl 1986) or recently (Phalan 2010, eBird), in the area but were not observed during the recent project. Those species, however, have a single or a few records only, thus they can be considered as rare vagrants.

The “history” of the observed species can be summarized as follows.

Black-winged Kite (*Elanus caeruleus*) Black-winged Kite is one of the two species that has not been reported historically from the area despite the long-term biodiversity monitoring between the 1960s and 1980s. In the ARDB database, there is only one record of the species near Monrovia (ARDB). *Andrews*, however, reports the species five times between October 2012 and March 2013; likely the same wintering individual (eBird). During the study period

Table 1. The birds of prey species observed between 2015 and 2017 in the frame of the project, indicating the occurrence of historic or other recent records

1. táblázat A projekt keretében 2015–2017 között megfigyelt ragadozómadár-fajok listája, megjelölve az egyéb korábbi vagy recens megfigyeléseket

Nr.	Species name		IUCN status	Suggested status in Nimba Mountains	Year of observation	Nimba book	ARDB	eBird
	English name	Latin name						
1	Black-winged Kite	<i>Elanus caeruleus</i>	Least concern	unknown – possible vagrant	2017	-	+	+
2	Bat Hawk	<i>Macheiramphus alcinus</i>	Least concern	unknown – potential, but unlikely breeder	2016	+	+	+
3	European Honey Buzzard	<i>Peris aptivorus</i>	Least concern	regular winter visitor	2015, 2016, 2017	+	+	+
4	Palm-nut Vulture	<i>Gypohierax angolensis</i>	Least concern	regular – probably only regular visitor as required habitat for resting is missing in the Liberian side of Nimba range	2015, 2016, 2017	+	+	+
5	Red-necked Buzzard	<i>Buteo auguralis</i>	Least concern	resident – breeder	2015, 2016, 2017	+	+	+
6	Lizard Buzzard	<i>kaupifalco monogrammicus</i>	Least concern	resident – breeder	2015, 2016, 2017	+	+	+
7	Crowned Eagle	<i>Stephanoaetus coronatus</i>	Near threatened	unknown – potentially breeding in the area	2017	+	+	+
8	Ayres's Hawk Eagle	<i>Hieraetus ayresii</i>	Least concern	resident – likely breeder	2015, 2017	+	+	+
9	Booted Eagle	<i>Hieraetus pennatus</i>	Least concern	rare winter visitor	2015, 2016	+	-	-
10	Cassin's Hawk Eagle	<i>Aquila africana</i>	Least concern	resident – likely breeder	2015, 2016	+	+	+
11	Western Marsh Harrier	<i>Circus aeruginosus</i>	Least concern	regular winter visitor	2015, 2016, 2017	+	+	+
12	African Harrier Hawk	<i>Polyboroides typus</i>	Least concern	resident – breeder	2015, 2016, 2017	+	+	+
13	Black Kite / Yellow-billed Kite	<i>Milvus migrans / M. aegyptius</i>	Least concern	winter visitor – regular visitor	2015, 2016, 2017	+	+	+
14	Shikra	<i>Accipiter badius</i>	Least concern	unknown	2016	+	+	-
15	Black Sparrowhawk	<i>Accipiter melanoleucus</i>	Least concern	unknown	2015	+	+	+
16	Common Kestrel	<i>Falco tinnunculus tinnunculus / F. t. rufescens</i>	Least concern	regular winter visitor – likely vagrant	2015, 2016, 2017	+	-	-
17	Gray Kestrel	<i>Falco ardosiaceus</i>	Least concern	unknown – likely breeder	2015, 2016, 2017	-	+	+
18	Eurasian Hobby	<i>Falco subbuteo</i>	Least concern	rare winter visitor	2017	+	-	-
19	Lanner Falcon	<i>Falco biarmicus abyssinicus</i>	Least concern	resident – breeder	2015, 2016, 2017	+	+	-
20	(African) Peregrine Falcon	<i>Falco peregrinus minor</i>	Least concern	resident – potential, but unlikely breeder	2015, 2016	+	+	+

*Indicates that Nimba region is on the edge of breeding distribution

Table 2. Birds of prey species with historic or recent records, but not observed during the project visits between 2015 and 2017

2. táblázat A területen korábban vagy recensen megfigyelt ragadozómadarak listája, amelyek nem kerültek szem elé a projekt során

Nr	Common name	Latin name	IUCN status	Reference	
				Colston & Curry-Lindahl (historic)	ebird (recent)
1	Scissor-tailed (formerly: swallow-tailed) Kite	<i>Chelictinia riocourii</i>	Least concern	+	-
2	African Cuckoo-hawk	<i>Aviceda cuculoides</i>	Least concern	+	+
3	Common Buzzard	<i>Buteo buteo</i>	Least concern	+	-
4	Grasshopper Buzzard	<i>Butastur rufipennis</i>	Least concern	-	+
5	Long-crested (hawk) Eagle	<i>Lophaetus occipitalis</i>	Least concern	+	-
6	Wahlberg's Eagle	<i>Aquila wahlbergi</i>	Least concern	-	+
7	Red-chested Goshawk	<i>Accipiter tousselini</i>	Least concern	-	+
8	African Goshawk	<i>Accipiter tachiro</i>	Least concern	+	-
9	Red-legged (formerly: Western Little) Sparrowhawk	<i>Accipiter erythropus</i>	Least concern	+	-
10	Long-tailed Hawk	<i>Urotriorchis macrourus</i>	Least concern	+	-
11	Bateleur	<i>Terathopius ecaudatus</i>	Near threatened	+	-
12	Short-toed Snake Eagle	<i>Circaetus gallicus</i>	Least concern	+	-
13	Brown Snake Eagle	<i>Circaetus cinereus</i>	Least concern	-	+
14	Congo Serpent Eagle	<i>Dryotriorchis spectabilis</i>	Least concern	+	-
15	Lesser Kestrel	<i>Falco naumanni</i>	Least concern	+	-
16	African Hobby	<i>Falco cuvierii</i>	Least concern	+	+

covered in this article, the species was observed only once, on the outskirts of Yekepa. Black-winged Kite is probably a rare, but regular visitor, which may occur in the region more frequently in the future, if the habitat becomes more open and drier because of climate change.

Bat Hawk (*Macheiramphus alcinus*) Several records exist from the foothills of Nimba (Colston & Curry-Lindahl 1986). According to ARDB the species is resident but sparsely occurring in Nimba region (ARDB). There is only one record of the species for Yekepa in 2014 (eBird). The single record of the species in this study is in line with literature and confirms the scarce occurrence of Bat Hawk in the area; even that single individual was traveling high above the site. Probably, it has never been common in the area considering its prey base.

European Honey Buzzard (*Pernis apivorus*) The species was reported both in 2009 and 2010 surveys (Phalan 2010). During the operation of the biological station, European Honey Buzzard was one of the seven most frequently observed birds of prey. It wintered regularly in Nimba using various forest habitats, roadside and more open areas in the mined areas, and

individuals were observed feeding on fruits (figs) beside invertebrates (Colston & Curry-Lindahl 1986). Recent distribution model indicates sparse occurrence of the species in the Nimba region in non-breeding season (ARDB). That is confirmed by the observations in eBird: the species was observed on seven occasions between 2013 and 2017, in the period October – April (eBird). In the past decade, Finnish (<https://www.luomus.fi/en/satellite-honey-buzzards>), Swedish (Hake *et al.* 2003, Strandberg *et al.* 2012), German (Meyburg *et al.* 2010), Dutch (<https://vimeo.com/85808414>) and Hungarian (Agostini *et al.* 2019) satellite-tracked individuals proved that Western Africa – including Nimba Mountains and Liberia – is an important wintering area for the species. Both satellite-tracking data and field observations suggest that the species can exploit various forest habitats from primary rain forests to plantations. Some individuals have well-defined wintering areas. Others – mostly immatures – may keep roaming probably due to intra-specific competition (Strandberg *et al.* 2008). During the reported study period, each year a single individual was observed several times. It was always the same individual within years (identified by the patterns of moulted primaries) suggesting that the individual was a wintering bird. Beside that observation, on 13 December 2015 one adult was flushed from the roadside by the car in the Firestone plantation (South Liberia, outside Nimba Mountains).

Palm-nut Vulture (*Gypohierax angolensis*) The species was recorded both during the surveys in 2009 and 2010 (Demey & Molubah 2009, Phalan 2010, Phalan & Lewis 2010). Palm-nut Vulture was described as the most common bird of prey species in the area (Colston & Curry-Lindahl 1986). Model shows the species as a relatively common species in West Africa (ARDB). According to eBird database, the species is not uncommon in Nimba region (eBird). This recent study confirms those findings. Palm-nut Vulture was a common species in Nimba Mountains, but mostly immature individuals were seen in the area. Outside of the project area, one adult male was seen above AMG concession area (port) in Buchanan. In addition, one pair was observed above the Firestone plantation.

Red-necked Buzzard (*Buteo auguralis*) The species is recorded in 2009 and 2010 surveys (Phalan 2010). Researchers of the biological research station reported it as the third most common raptor at Nimba found mostly in forested habitats. In two occasions, the species was found nesting at Nimba in (sub)montane rainforest at about 900 m (Colston & Curry-Lindahl 1986). Recent models also suggest that the species is common in the region (ARDB). According to other recent observations, the species is not uncommon in Nimba region (eBird). Recent study found Red-necked Buzzard a common species in the project area. Observations suggest that there is at least one active eyrie on the western slopes of Mount Nimba (under LiberCell) towards Yekepa. It is likely that a few more pairs nest in the project area.

Lizard Buzzard (*Kaupifalco monogrammicus*) Surveys recorded the species both in 2009 and in 2010 (Phalan 2010); earlier evaluation also described the species as common (Colston & Curry-Lindahl 1986). Species distribution model also refers to the species as not infrequent in Nimba area (ARDB) that is supported also by concrete observations

(eBird). Accordingly, recent records confirmed that Lizard Buzzard is still common in the project area. It was regularly observed in open areas around Yekepa, at roadsides and in the rainforest mostly perching above the road. Based on the observations, it is likely that at least two resident pairs can be found within the project area: one in Yekepa and the surrounding fields nearby and another one in the area between the Picnic site and LiberCell tower.

Crowned Eagle (*Stephanoaetus coronatus*) Previous records mention the species only from three or four subsequent years, dating the last observation to 1971. Authors suggested that the species was likely rare because of the hunting-driven decrease of duikers (small antelope) and monkeys, which made up most of the diet of Crowned Eagle (Colston & Curry-Lindahl 1986). In more recent times the species was reported “present” (Phalan 2010). The model predicts rare occurrence of the species in the region (ARDB). There are two records of the species in the region: one from the Liberian (1988) and one from the Guinean side (2004) of Nimba Mountains (eBird). The species was observed only once (2017) during the study period, but then two adult birds were seen over primary rainforest, which is the species’ typical habitat. Given that the main prey species populations are strongly depleted due to overhunting, it is rather questionable if the area can support a breeding pair.

Ayres’s Hawk Eagle (*Hieraetus ayresii*) Earlier evaluation referred to the species as rare, but regularly seen in the same savanna area close to the Guinea border (Colston & Curry-Lindahl 1986). More recently, the species was observed only during the 2009 survey (Phalan 2010). Distribution model shows the species as infrequent but regular in the region (ARDB). Independently from the recent project, the species were observed four times between 2012 and 2017, always in winter (eBird). The few but regular observations during the recent project and the behaviour of the individual(s) may suggest that there is at least one occupying bird in the project area.

Booted Eagle (*Hieraetus pennatus*) There was only one record from Yekepa golf course on 2 March 1981, close to the lowland rain forest (Colston & Curry-Lindahl 1986). No other records were found about the species from the region. Distribution model does not predict the species to southwest West Africa including the entire area of Liberia, a big part of Ivory Coast and Ghana and considerable areas in Guinea and Sierra Leone (ARDB). There is no data about the species in the region in the eBird database. The main wintering area of the European population is in the Sahel, one satellite-tracked Spanish Booted Eagle had its main wintering area in the tropical rainforest between Guinea and Sierra Leone (Mellone *et al.* 2013). Climate, geography, and vegetation is similar to that of wintering area in Nimba Mountains, what makes the sightings in 2015 and 2016 less unique. Individuals, however, were seen only one occasion in both years suggesting that they were on the move and did not establish wintering territory. It is noteworthy that in 2015 the bird was seen during the *harmattan* period, so it might have been blown off-course by the strong northeastern wind.

Cassin’s Hawk Eagle (*Aquila africana*) Former species evaluation described Cassin’s Hawk Eagle as a rare species; there was only one record between 1963 and 1982 (Colston &

Curry-Lindahl 1986). The species was recorded during both 2009 and 2010 surveys (Phalan 2010). The distribution model shows that Cassin's Hawk Eagle is not infrequent in the region of Nimba Mountains (ARDB). The species was observed in 1988 and in 2017 in Nimba Mountains. The latter is a single observation in September, while in 1988 the species was observed three consecutive days (28–30 September) on the Nimba ridge (eBird). According to the observations of the recent study, there was one bird likely occupying an eyrie in 2015, but it remained unclear, if it was only a single individual or there was a pair in the region. The only observation in 2016 and the lack of own observation in 2017 suggests that the species is uncommon in the area.

Western Marsh Harrier (*Circus aeruginosus*) Only two earlier records mention the species – 11 and 19 February 1971 – in the Grassfield, near Yekepa, which likely belong to the same individual (Colston & Curry-Lindahl 1986). The species was not observed in 2009 and 2010 surveys (Phalan 2010). Distribution model predicts sparse occurrence of the species in the area (ARDB). A local birdwatcher recorded the species on four occasions between 2013 and 2016; both sexes were seen (eBird). During the recent study, Western Marsh Harrier was observed each year, once there were even two birds. Repeated observations of the same individual (based on molt) in 2017 suggest that Nimba Mountains serves as wintering site for the species. All individuals were observed over larger grassland areas near Yekepa and up along the mountain ridge.

African Harrier Hawk (*Polyboroides typus*) The species was recorded during two subsequent surveys in 2009 and 2010, which also obtained evidence of breeding (on page 16): “fully fledged juvenile following an adult at Gangra, with plaintive begging calls, on 26 April 2010” (Phalan 2010). Earlier evaluation refers to the African Harrier Hawk as the most common bird of prey species (Colston & Curry-Lindahl 1986). Being a generalist species, it forages on a wide spectrum of food sources from fruits through insects (including wasp larvae) to vertebrates. The species seasonally shared the forest and partly the niche in Nimba region with the European Honey Buzzard (Colston & Curry-Lindahl 1986). African Harrier Hawks suggested to be common in Nimba region according to distribution model, which is supported by historic and recent records (ARDB, eBird). Observations between 2015 and 2017 confirmed that African Harrier Hawk is still one of the most common raptor species in the region together with Palm-nut Vulture. Behavioral and movement patterns of observed individuals suggested that at least one pair occupying eyrie in the western slopes of Mount Nimba or in the adjacent lower areas. It is likely that more pairs breed in the area. Apart from the Nimba region, one individual was seen above AMG concession area and port in Buchanan.

Black Kite (*Milvus migrans migrans*) / **Yellow-billed Kite** (*Milvus migrans aegyptius* / *parasitus*) The two subspecies are discussed together, because separation the two subspecies in the field was not possible due to the observation distance and sometimes because of the light conditions. During the operation period of the biological research station the species was seen regularly, but infrequently, mostly over open areas (Colston & Curry-Lindahl 1986). Kites were not recorded in 2009–2010 surveys (Phalan 2010). ARDB indicates

Nimba region as an area with frequent occurrence of both subspecies (ARDB). Andrews reports the species fourteen times from the period 2012 and 2017 adding that Black/Yellow-billed Kites. Recent observations somewhat contradict ARDB results of extrapolations. Although kites were recorded all along the way from Buchanan to Yekepa, the number of observations decreased significantly towards the north. In the Nimba region, kite occurrence seemed to be rather scarce, but when occurring they were seen usually in small flocks. On one occasion, a few individuals were observed gliding and soaring low above the edge of a bush fire near the village of Yekepa, confirming that fire attracts the species, probably because of the easy prey (Borrow & Demey 2014, Gosford 2015).

Shikra (*Accipiter badius*) In January 1968, one female was reported with worn plumage and that is the single record of the species. The individual was likely on migration as the species breed in more northern areas (Colston & Curry-Lindahl 1986). In the 2010 zoological evaluation based on the 2009–2010 surveys and literature data, Shikra is mentioned in reference to Erard (Phalan 2010). However, as there is no concrete record mentioned, it is unclear if that data is independent from the earlier record. ARDB contradicts that showing Liberia and the Nimba region within as a breeding ground only for the species (ARDB). Andrews recorded an immature individual in December (eBird). During the observations between 2015 and 2017, the only record was a male in December 2016 above Blue Lake on a dry slope with grass and scrub vegetation, and small trees above a creek. It was tame and could be approached close.

Black Sparrowhawk (*Accipiter melanoleucus*) There is only one record from Nimba in 1971 (Colston & Curry-Lindahl 1986). The distribution model suggests scarce but regular occurrence of the species in the region (ARDB). Recently, there is record of one individual in April 2013 and in September 2016 an adult and an immature along with a third bird that he heard but did not see (eBird). During the 2015–2017 survey, the species was seen only once from the mountain top of Nimba as it was flying in the distance above the lowland rainforest in Ivory Coast territory. Given its cryptic lifestyle, however, Black Sparrowhawk may be more frequent than observations suggest.

Common Kestrel (*Falco tinnunculus*) In Liberia, both the West African resident *F. t. rufescens* and the European migrant *F. t. tinnunculus* occur. A recovery of a Swiss-ringed bird in 1972 proves the latter (Moreau 1972). Earlier reports describe Common Kestrel as not uncommon; it was regularly seen in various open, grassy habitats in the area (Colston & Curry-Lindahl 1986). Recently, there is one observation from the region recorded during the 2009 survey (Phalan 2010). None of the earlier records identify the subspecies. Other recent sightings are related to the Monrovia area (ARDB, eBird). In recent project, the species was observed in each year between 2015 and 2017. Based on the plumage and the behavior of the observed individuals, both subspecies mentioned above occur in Nimba Mountains.

Grey Kestrel (*Falco ardosiaceus*) The species has no record from the period 1963–1982. Even in 2010, when the species was recorded, the following note was added to the observation:

“One seen c. 2 km west of Gangra on 8 April 2010. The only previous records of this species from the Nimba Range are those of Gatter (1998).” (Phalan 2010). ARDB database has recent sighting in the area and predicts Nimba Mountains appropriate for the species (ARDB). A local birdwatcher, however, recorded the species twenty times between 2012 and 2017, always in the period October–December (eBird), which indicates regular presence of the species. During the reported study period in this project, the species was seen each year. They were using the same type of dry scrublands consisting of patches of shrub and short trees, and relatively low grassland vegetation, where they hunted on Orthoptera (grasshoppers, crickets and locusts) and Anisoptera (dragonflies). Increasing number of observations suggest that the species has gradually moved in the area in the past 20–30 years.

Eurasian Hobby (*Falco subbuteo*) The observation of the species in 1971 in Yekepa was the first record of the species in Liberia (Colston & Curry-Lindahl 1986), although it was already known to be regular in winter in Ivory Coast (Brunel & Thiollay 1969). Zoological evaluation of the Liberian part of Nimba Mountains also mentions the species (Phalan 2010), but in reference to Erard and Brosset (2003). However, as Erard and Brosset’s work is mostly a summary of several previous works in the entire Nimba mountain range including the Guinean and Ivory Coast part, and as they did not indicate of the exact locations of observations at the species accounts, it is not clear if their data can evidently be applied also to the Liberian part of the mountains. Satellite-tracking of Eurasian Hobbies confirmed that the species main wintering area is in sub-equatorial Africa, however, they may travel across certain parts of West Africa (Strandberg *et al.* 2008, Meyburg *et al.* 2011). There are no observations recorded in the ARDB and eBird databases from the Nimba area. Despite that the area hosted large flocks of Barn Swallows (*Hirundo rustica*), House Martins (*Delichon urbicum*) and Swifts (*Apus* spp.) – the most important prey species – Eurasian Hobby was recorded only on two occasions, both in 2017. The Hobbies were hunting in both cases, once on swallows and martins high up in the air and on dragonflies low above the ground, on the other occasion.

Lanner Falcon (*Falco biarmicus abyssinicus*) There is only one record from Mount Nimba ridge (13 January 1982). The observed individual might have been a short-distance intra-African migratory bird breeding no further than the Guinean savanna belt or the Sahel and it might have belonged to the North African subspecies *F. b. erlangeri* (Colston & Curry-Lindahl 1986). Lanner Falcon was recorded both in 2009 and 2010 (Phalan 2010). He comments on the species as: “One seen between Yekepa and Grassfield on 10 April 2010. A rare dry season visitor to the north of Liberia, expanding southwards as a result of the opening up of the forest (Gatter 1998).” Indication of subspecies was given in the latter case. ARDB shows Nimba Mountains as an area on the edge of the breeding range, but there is no observation indicated (ARDB). There are no recent records of the species from the Nimba region in the eBird database either despite known birdwatching efforts in Yekepa village between 2012 and 2017. It is especially interesting therefore, that the species was seen every year during the reported study period. In the light of the comments above, it is especially interesting that an adult pair was seen above the village of Yekepa and the forest nearby (Picnic site), once even in the company of an immature bird. They were hunting together clearly as established pairs of

falcons do. Once the adults were seen perching together in the canopy of a high tree at the edge of the village; one of them was feeding on a mid-sized bird, while the other one was preening only a few meters away. That pair certainly was in its territory. The species was never seen on higher elevations. Based on the behavior and plumage, as well as on the location the observed Lanner Falcons belong to the *F. b. abyssinicus* (African) race.

African Peregrine Falcon (*Falco peregrinus minor*) Several sightings of the species were recorded between November and March, however only after the deforestation and mining on Nimba mountain top. They highlight that there are no records of Peregrines from the 1960s, when the monitoring program had already been running, but there was still a primary forest on the mountain top. They did not identify the subspecies, however, *F. p. calidus* is mentioned in general without any reference to Nimba as a wintering subspecies in Africa. Peregrine was recorded only during the 2009 survey (Phalan 2010); also, without identifying the subspecies. Thus, it is not possible to decide whether those sightings belonged to resident (*F. p. minor*) or wintering (*F. p. peregrinus* or *F. p. calidus*) birds. The problem of distinction between resident and wintering subspecies was already described in 2003 and Peregrine Falcon, Eurasian Kestrel, and Black Kite were brought as examples, emphasizing that only regular observations in the wintering period could solve the problem (Erard & Brosset 2003). Species distribution model predicts that Peregrines do not breed in the area, but they occur on migration or roaming (ARDB). Recently, there are only two records of the species (without any further details) from 1988 in the Liberian Nimba ridge and in the Guinean side of Nimba in 2004 (eBird). During the observations in the recently reported study period, Peregrine Falcon was observed several times in 2015 and 2016. At least on three occasions, the individuals were seen at close range and the African race (*F. p. minor*) was clearly identified. Mining in Nimba Mountains left several cliffs behind and there are also some natural cliffs in the area that can be appropriate for nesting, however, despite the intensive search no Peregrine Falcon nests were found on the cliffs in the project area.

Conclusions

Historic and recent data allow us to compare species composition of old and new data sets. Species can be divided into three groups:

- 20 species out of the total 36 observed in the Liberian part of Nimba Mountains were recorded both historically and recently;
- 10 species have historic records only, without any recent observations;
- 6 species were observed for the first time only recently (*Figure 1, Figure 3*).

Among the species observed also then and now, we find common breeding species and winter visitors as well. Their typical habitats include forests, shrublands and grasslands, they do not form a habitat-specific group.

Birds of prey species, observed only between 1963 and 1982, include both forest species and species of open habitats. However, most of them have only very few records, thus they can be considered vagrant birds. Considering the research effort (several months per year)

and the long run of the biological research station offered more chance to detect rare visitors, compared to the more ad hoc observations recently.

The most interesting group is formed by those species observed recently, but not detected previously. Looking at the pattern, Lanner Falcon must also be added to the list, as it has only a single historic record, but now settled in the area. It would be logical to assume that during the period 1963–1982, when targeted observations for birds were being done, all or most species were recorded and only a few, if any rare forest-dwelling species could have avoided detection. However, out of the six plus one species – Black-winged Kite, Grasshopper Buzzard, Wahlberg’s Eagle, Red-chested Goshawk, Brown Snake Eagle, Lanner Falcon and Gray Kestrel – that have not been recorded previously, only the Red-chested Goshawk is a forest-dwelling species. The other ones are more related to wooded or open grassland habitats. Inhabiting open habitats implies a higher likelihood of detection. Lack of records of those species in the previous 19-year period suggests their likely absence previously.

Two species are especially interesting. Gray Kestrels were observed on a number of occasions recently. They use open habitats, often near roads and they are tame – one can get close to them. It is hard to believe that such a conspicuous species went unnoticed for almost two decades. Although Lanner Falcon was mentioned by Colston and Curry-Lindahl (1986), but only once and they suggested that it was a migrant from the Sahel. Even recently, only Phalan (2010) mentions the species: “*One seen between Yekepa and Grassfield on 10 April 2010.*” Observations in the project between 2015 and 2017 suggest, however, that the species is not only present in the area, but it likely breeds. A pair regularly and a juvenile once were observed just above and around the village of Yekepa. It is hard to believe again that such an obvious bird would have gone unnoticed by expert ornithologists for almost 20 years.

The explanation of the phenomenon may lie in the guidebook to the Liberian bird species in a comment on Lanner Falcon: “*A rare dry season visitor to the north of Liberia, expanding southwards as a result of the opening up of the forest*” (Gatter 1998). Increasing presence of open habitat dwelling species can be an indication of the encroachment of savanna replacing rainforest habitats, which would be in line with climate scenarios (Niang *et al.* 2014). Other study described the long-term decrease of tree species richness and density in Senegal (Gonzalez 2001), which was likely not restricted to the study region of that research. More research is needed, however, to understand the correlation between the presence of those species and local habitat change.

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Appendix 1. Species account of detailed observations in the period 2015–2017
 1. melléklet A 2015–2017 közötti időszakban feljegyzett ragadozómadár-fajok megfigyeléseinek részletes leírása

Date	Site name	Coordinates	Nr	Sex	Age	Comment
Black-winged Kite (<i>Elanus caeruleus</i>)						
17.12.2017	AML Workshop	7.566572° -8.542879°	1	unknown	adult	9:30 – Perching on a nearby tree using as a vantage point to hunt
Bat Hawk (<i>Macheiramphus alcinus</i>)						
16.12.2016	Hundred men camp / AML Workshop	7.566572° -8.542879°	1	unknown	immature	10:30 – Soaring from N to S-SW high above the camp. Probably immature based on the more extended white underpart (compared to adults).
European Honey Buzzard (<i>Pernis ptilorhynchus</i>)						
01.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	12:00 – Flying over heading north. It was moulting the 4. primaries
02.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	11:12 – The same individual as yesterday. Flying over.
07.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	11:36 – One individual was flying over – the same individual as earlier.
10.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	11:20 – The same, previously seen moulting individual was gliding from northeast to southwest
13.12.2015	Firestone plantation	6.307396° -10.435700°	1	unknown	unknown	NOT in Nimba area. On 13 December 2015 one adult was seen also in the Firestone plantation. It was flushed by the car from the roadside. Dutch sat tracked bird crossed the area in 2013.
06.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	unknown	14:30 – Soaring high above AML Headquarter. Moulting primaries.
07.12.2016	LiberCell	7.535047° -8.527079°	1	unknown	adult	12:10 – Soaring above the site. Moulting heavily.
17.12.2016	Blue Lake	7.540280° -8.497993°	1	unknown	unknown	12:00 – Flying high above the mountain top above Blue Lake, towards NE
16.12.2017	CellCom	7.519895° -8.517937°	1	unknown	unknown	15:30–17:30 – 1 individual was flying low above the top of Nimba
18.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	11:00–11:20 – 1 individual was mobbed by a pair of Lanner Falcon

Date	Site name	Coordinates	Nr	Sex	Age	Comment
Palm Nut Vulture (<i>Gypohierax angolensis</i>)						
25.11.2015	Buchanan	5.861408° -10.031430°	1	male	adult	NOT in Nimba area. One adult male was seen above Arcelor Mittal concession area and port in Buchanan.
25.11.2015	Firestone plantation	6.484882° -10.322318°	2	pair	adult	NOT in Nimba area. One pair was observed also above the Firestone plantation
29.11.2015	LiberCell	7.535047° -8.527079°	2	unknown	immature	An immature circled up above the security office 29/11/2015 LiberCell tower; Morning – Immature individual flying over; Afternoon – 2 immature individuals flying over
30.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	immature	Morning – One immature individual passed through towards northeast then soaring up above LiberCell tower
02.12.2015	LiberCell	7.535047° -8.527079°	2	unknown	immature	12:55 – Two individuals (an immature and an adult male) soaring up above LiberCell; 13:08 – An immature individual is playing in the air
07.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	immature	12:42 – An immature, moulting individual was flying by towards south
08.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	immature	10:12 – An immature individual arrived from the south and the returned after two circles above the tower
11.12.2015	LAMCO silos/ Blue Lake	7.541275° -8.498285°	1	unknown	immature	16:41 – An immature was flying towards Blue Lake; 17:03 – An immature (maybe the previously seen) was soaring up above the (Guinea side) peak at Blue Lake
12.12.2015	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	unknown	immature	15:18 – An immature individual was perching on a tree on top the ridgeline on Yekepa side between CellCom and Community tower.
07.12.2016	LiberCell	7.535047° -8.527079°	2	male / unknown	adult / immature	11:40 – Adult male attacked a Booted Eagle between CellCom and LiberCell; 11:50 – An immature arrived low and soared before heading towards Guinea
11.12.2016	Hundred men camp / AML Workshop	7.566572° -8.542879°	2	unknown	unknown / immature	09:59 – An immature and an adult circled up with an adult that headed towards northwest
14.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	immature	7:40 – Soaring up above the village (security building)
15.12.2016	Picnic site	7.555649° -8.518559°	1	unknown	immature	10:00 – An immature soared above the site

Date	Site name	Coordinates	Nr	Sex	Age	Comment
17.12.2016	Blue Lake	7.540280° -8.497993°	1	unknown	adult	13:00 – An adult flew southwards high
19.02.2017	Gangra top	7.547211° -8.633461°	2	unknown	juvenile / subadult	17:00 – A juvenile was soaring low and a subadult was displaying above the top
14.12.2017	CellCom	7.519895° -8.517937°	1	unknown	immature	14:00–15:00 – An immature was perching on a small tree on the ridge
17.12.2017	CellCom	7.519895° -8.517937°	1(2)	unknown	immature	10:00 – An immature close to the ridge; 14:45–15:30 – An immature was observed
Red-necked Buzzard (<i>Buteo auguralis</i>)						
28.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	11:15 Soaring up from the valley (Camp Four) towards CellCom tower
02.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	Around 16:00 – One individual
10.12.2015	LiberCell	7.535047° -8.527079°	2	unknown	unknown	11:25 – Two individuals were flying over, one soaring high and the other one was soaring up from below from the direction of Camp Four. Both headed to the Nimba ridge (CellCom tower); 11:51 – One of the individuals returned and stooped with folded wings from high above LiberCell tower towards Yekepa/Camp Four
11.12.2015	LiberCell	7.535047° -8.527079°	1(2)	unknown	adult	11:10 – One individual with freshly growing primaries was soaring up from under the ridgeline from the direction of Camp Four heading towards Blue Lake; 12:38 – An individual was, rollercoasting' to under the LiberCell ridgeline towards Camp Four, then soaring up again
12.12.2015	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	unknown	unknown	14:48 – One individual was soaring up between CellCom tower and Blue Lake then stooping toward Yekepa side of the ridge (probably attacking an Ayress Hawk Eagle)
10.12.2016	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	unknown	unknown	13:00 – Gliding along the ridge
11.12.2017	LiberCell	7.535047° -8.527079°	1	unknown	unknown	12:05 – Soaring up from below to high above the tower. Light harmattan, 20–25°C

Date	Site name	Coordinates	Nr	Sex	Age	Comment
12.12.2017	Blue Lake	7.540280° -8.497993°	2	unknown	unknown	10:00 – 2 individuals soared near the top (close to the border). Area between Blue Lake and Guinea border
13.12.2017	Yekepa	7.577121° -8.533847°	1	unknown	unknown	1 individual soaring high above the village
Lizard Buzzard (<i>Kaupifalco monogrammicus</i>)						
30.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	adult	Morning – Soaring up into a cloud and disappearing to north
02.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	12:42 – Soaring up high above the hill
05.12.2015	Yekepa	7.577121° -8.533847°	1	unknown	unknown	08:39-09:13 One individual was perching on a standing dead tree above Yekepa Youth Centre apparently hunting
08.12.2015	Hundred men camp/AML workshop	7.566572° -8.542879°	2	unknown	unknown	16:52 – Two individuals were perching on the wire of the distribution (electric) line. One of them caught a lizard
11.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	11:40 – Shortly soaring then landing on a high tree between LiberCell and Picnic site. It flew off a few minutes later and joined to a soaring Peregrine above the same spot
12.12.2015	Hundred men camp/AML workshop	7.566572° -8.542879°	1	unknown	unknown	10:05 – One individual was perching on the wire at same spot as a few days earlier
12.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	16:09 – One individual was landing on a tree on the side of the CellCom road just down of LiberCell tower (between LiberCell tower and Picnic site). Flushed by the car landed on an other tree near the road. Very tame; it let the car very close
06.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	unknown	Morning – soaring above the village
07.12.2016	Picnic site	7.555649° -8.518559°	1	unknown	unknown	12:30 – Above the site
08.12.2016	Hundred men camp/AML workshop	7.566572° -8.542879°	1	unknown	unknown	10:30 – Soaring and hunting along the road
12.12.2016	Picnic site	7.555649° -8.518559°	1	unknown	unknown	12:30 – Perching on a tree (6-7 m) at the edge of a forest clearing. Very tame

Date	Site name	Coordinates	Nr	Sex	Age	Comment
16.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	unknown	13:30 – In the village, near the canteen
10.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	9:00–9:30 – It was perching on a high branch in the otherwise closed forest above the road up to LiberCell tower between Picnic site and workshop. Harmattan wind arrived early morning, with strong NE wind, 20–25°C
12.12.2017	Blue Lake	7.540280° -8.497993°	1	unknown	unknown	10:00 – 1 individual soaring. Area between Blue Lake and Guinea border
16.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	12:58 – gliding high towards Yekepa
17.12.2017	Hundred men camp/AML workshop	7.566572° -8.542879°	1	unknown	unknown	9:30 – perching on poles on the side of the road and hunting on prey in the roadside ditch
Crowned Eagle (<i>Stephanoaetus coronatus</i>)						
12.12.2017	Blue Lake	7.540280° -8.497993°	2	unknown	adult	10:00 – Two adults were soaring above the valley between Blue Lake and LiberCell tower often submerging to the old forest in the valley and coming up again
Ayres's Hawk Eagle (<i>Hieraetus ayresii</i>)						
02.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	adult	16:00 – One adult individual is flying over
10.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	adult	13:23–13:38 – It came along LiberCell ridge from up heading towards Yekepa down to the Picnic site. There it started to soar and went up very high. It stooped twice, but not on prey, then it stopped mid-air against the wind for a while (like Short-toed Eagles, but never hovered). It headed back along the ridge, then turned towards the towers on the top. It had a distinctive white head like in the previous case; 14:50 – It stooped towards the Nimba ridge; 15:00 – It came very low and close to LiberCell tower. Apparently, the observers did not disturb the bird. It flew back to the towers on Nimba ridge
12.12.2015	Nimba ridge	From 7.5112826° -8.529177° to 7.5339939° -8.502132°	2	unknown	adult	14:48 – One individual (light morph) was gliding above the ridgeline from the direction of CellCom tower towards Blue Lake; 14:58 – A dark morph individual was gliding above the ridge from the eastern side of Nimba towards Blue Lake (to the same direction as the other individual)

Date	Site name	Coordinates	Nr	Sex	Age	Comment
16.12.2017	CellCom	7.5119895° -8.517937°	1	unknown	unknown	15:30–17:30 – Hunting along the ridge – two attacks into the canopy without result
18.12.2017	Picnic site	7.555649° -8.518559°	2	unknown	unknown	12:00–13:00 – 2 individuals soaring above the site were observed
Booted Eagle (<i>Hieraetus pennatus</i>)						
10.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	11:55 – An individual (medium phase) arrived low above LiberCell, it soared up and headed towards Nimba ridge / CellCom tower.
07.12.2016	LiberCell	7.535047° -8.527079°	1	unknown	unknown	11:40 – A Palm Nut Vulture attacked it
Cassin's Hawk Eagle (<i>Aquila africana</i>)						
29.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	Morning – Soaring high from west to east
30.11.2015	LiberCell	7.535047° -8.527079°	1	male	adult	Late morning – It appeared between LiberCell tower and Picnic site, flying low and calling. It perched twice on two still standing dead wood lower on the hill, first on Yekepa side, then on the side of the road up the ridge. It was calling when flying off and changing the perch site. Then it soared up, spent a few minutes above the site and left toward the ridge. Apparently, it did not care much of the observers. Adult male (?)
02.12.2015	LiberCell	7.535047° -8.527079°	1(2)	male	adult	14:05 – A displaying individual was coming from high from the direction of Blue Lake, rollercoasting then stooping down under the LiberCell hilltop towards the valley to Camp Four. 14:39 – An individual (likely the previous one) was soaring up from the Picnic site towards the Nimba ridge
15.12.2016	LiberCell	7.535047° -8.527079°	1	unknown	adult	14:00 – Perching on a tree above the asphalt road between LiberCell tower and Picnic site. Very tame, let the car close
Western Marsh Harrier (<i>Circus aeruginosus</i>)						
26.11.2015	Nimba ridge	From 7.5112826° -8.529177° to 7.533939° -8.502132°	1	unknown	immature	Late afternoon – A immature individual (in 1 cy plumage) soaring above the peak above Blue Lake (Guinea side) heading to north

Date	Site name	Coordinates	Nr	Sex	Age	Comment
10.12.2016	Hundred men camp/AML workshop	7.566572° -8.542879°	1	male	adult	9:15 – Flying low and scanning the reed and grassland area between the workshop and the village
11.12.2016	Hundred men camp/AML workshop	7.566572° -8.542879°	2	unknown	unknown	9:00 – Above the site, where one ind was seen on 10.12.2016. Soaring high above towards N. They molted the primaries
11.12.2017	CellCom	7.519895° -8.517937°	1	female	adult	1 adult female was hunting low above the grassland, sometimes soaring up a little higher. Light harmattan, 20–25°C
16.12.2017	CellCom	7.519895° -8.517937°	1	female	adult	15:30–17:30 – 1 adult female was seen hunting low above the grassland (maybe the previously observed individual)
18.12.2017	Picnic site	7.555649° -8.518559°	1	female	adult	10:30 – 1 adult female soaring up was observed
African Harrier Hawk (<i>Polyboroides typus</i>)						
25.11.2015	Buchanan	5.861408° -10.031430°	1	unknown	adult	NOT in Nimba area. One individual was seen above ArcelorMittal concession area and port in Buchanan
28.11.2015	LiberCell	7.535047° -8.527079°	2	pair	adult	10:37 – Two individuals (male and female) playing and displaying above/between LiberCell and Picnic site; 11:06 Soaring up on a thermal into the clouds towards CellCom tower
30.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	adult	Morning – One individual flying over
02.12.2015	LiberCell	7.535047° -8.527079°	2	pair	adult	11:24 – Two individuals. One is displaying, going rollercoaster, clapping with its wings above its back and calling; 15:00 – One individual is soaring towards the Nimba ridge
07.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	11:36 – Displaying individual
10.12.2015	LiberCell	7.535047° -8.527079°	1	unknown	adult	10:33 – One individual was flying from the Nimba ridge towards Yekepa; 12:08 – One individual arrived from Yekepa and headed towards Community tower along the LiberCell ridge
10.12.2016	Hundred men camp/AML workshop	7.566572° -8.542879°	1	unknown	unknown	9:00 – It soared up with prey and flew to a wood nearby (nest?)

Date	Site name	Coordinates	Nr	Sex	Age	Comment
11.12.2016	Hundred men camp/AML workshop	7.566572° -8.542879°	2	pair	adult	10:50 – Soaring together above the area
16.12.2016	Gangra top	7.547211° -8.633461°	1	unknown	unknown	17:50 – Hunting by moving around the top of bushed and low branches of trees near the road.
17.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	unknown	9:00 – Looking for something on the low pine trees at the market in the centre of Yekepa. It was not afraid of men and cars
15.12.2017	CellCom	7.519895° -8.517937°	1	unknown	unknown	11:30–12:00 – 1 individual was observed
17.12.2017	CellCom	7.519895° -8.517937°	1	unknown	unknown	14:45–15:30 – 1 immature was observed flying above the LoneStar tower
18.12.2017	Picnic site	7.555649° -8.518559°	2	unknown	adult / immature	12:00–13:00 – an immature and an adult were observed as they soared up
Black Kite / Yellow-billed Kite (<i>Milvus migrans</i>) / (<i>Milvus migrans aegyptius</i>)						
06.12.2015	LiberCell	7.535047° -8.527079°	3	unknown	unknown	Three individuals were soaring from northeast to southwest. Intact plumage (immature birds?).
11.12.2015	Hundred men camp / AML workshop	7.566572° -8.542879°	4	unknown	unknown	13:45 – Four individuals were hunting very low above the bush fire along the road catching escaping animals
06.12.2016	Yekepa	7.577121° -8.533847°	1	unknown	unknown	15:00 –Above the village
07.12.2016	Picnic site	7.555649° -8.518559°	3	unknown	unknown	13:20 – Soaring above the site
12.12.2017	Blue Lake	7.540280° -8.497993°	6	unknown	unknown	Area between Blue Lake and Guinea border; 10:00 – 6 individuals flying high to direction of W – NW
16.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	1 individual gliding high from the top towards Yekepa
Shikra (<i>Accipiter badius</i>)						
16.12.2016	Blue Lake	7.540280° -8.497993°	1	male	adult	Afternoon. On one of the terraces above the lake, in dry, open hillside with grass and bushy vegetation and low tree. Tame, but flew towards the eastern side of Nimba after bearing a few minutes of photographing

Date	Site name	Coordinates	Nr	Sex	Age	Comment
Black Sparrowhawk (<i>Accipiter melanoleucus</i>)						
29.11.2015	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	unknown	unknown	Afternoon – one individual flying on the eastern side of Nimba high above the lowland forest
Common Kestrel (<i>Falco tinnunculus</i>)						
26.11.2015	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	male	adult	Late afternoon – An adult male individual of relatively large size was perching and hunting from the perch on the ridgeline (same place as later a Grey Kestrel) between the Community and CellCom tower
09.12.2016	CellCom	7.519895° -8.517937°	1	male	adult	16:45 – Soaring up from the direction of Yekepa to the tower, then glided along the ridge toward SE
10.12.2017	LiberCell	7.535047° -8.527079°	1	male	adult	9:00–9:30 – An adult male hovered and hunted successfully on large insects (Orthoptera). Harmattan wind arrived early morning, with strong NE wind, 20–25°C
14.12.2017	CellCom	7.519895° -8.517937°	1	unknown	unknown	14:00–15:00 a heavily moulting individual was seen, but due to light conditions it was impossible to identify age or sex
16.12.2017	CellCom	7.519895° -8.517937°	2	male / female	adult	11:10 – 1 adult female (likely a local <i>F. t. rufescens</i>) was seen hovering; 11:20 – 1 adult male (likely a wintering <i>F. t. tinnunculus</i>) was seen hunting while on the move from N to S
17.12.2017	CellCom	7.519895° -8.517937°	2	male / female	adult	11:00–1 adult male was observed; 14:45–15:30 – 1 adult female was observed
18.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	10:30–11:00 – 1 individual was observed
Grey Kestrel (<i>Falco ardosiaceus</i>)						
29.11.2015	LiberCell	7.535047° -8.527079°	1	unknown	unknown	Afternoon – one individual was flying over
03.12.2015	EA area, Yekepa	7.581038° -8.534307°	1	male	adult	08:21 – An adult male flew displaying (flip-flopping) from the Yekepa CellCom tower towards the market. He landed for a second on the large tree in front of EA area entrance gate other side of the road

Date	Site name	Coordinates	Nr	Sex	Age	Comment
12.12.2015	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	male	adult	13:30 – An adult (male?) was hunting between Community tower and CellCom tower from perch successfully and caught a larger, green-brown locust. Very confidential, let the car come close
12.12.2015	AML HQ, Yekepa	7.581038° -8.534307°	1	male	adult	16:30 – One adult individual (male?) was coming from the direction of Yekepa market to the AML Headquarter and landing on a large Christmas-tree near the HQ building (direction of Guinea). Then it left towards the workshop after a few minutes
13.12.2016	Nimba ridge	From 7.512826° -8.529177° to 7.533939° -8.502132°	1	unknown	unknown	16:45 – Gliding from the SW edge of Nimba ridge towards LiberCell
14.12.2016	Hundred men camp / AML workshop	7.566572° -8.542879°	1	unknown	unknown	15:25 – Further south of Hundred men camp/AML workshop, near the concession entrance gate (7.557373° -8.553866°). Perching on trees near the road, apparently hunting
15.12.2016	LiberCell	7.535047° -8.527079°	1	unknown	immature	12:50 – Soaring and hunting around LiberCell tower. Later landed and perched on a dead tree on the slope towards Yekepa just below LiberCell tower.
17.12.2016	Blue Lake	7.540280° -8.497993°	1	unknown	unknown	12:00 – Perched on a tree on the top above Blue Lake (towards the Guinea border)
15.12.2017	Picnic site	7.555649° -8.518559°	2	unknown	unknown	11:40–12:10 – 2 individuals hunting on dragonflies
15.12.2017	CellCom	7.519895° -8.517937°	1	unknown	adult	11:30–12:00 – 1 individual was perching and hunting on insects using small trees on the ridge as vantage points
Eurasian Hobby (<i>Falco subbuteo</i>)						
16.12.2017	CellCom	7.519895° -8.517937°	1	unknown	unknown	15:30–17:30 – 1 individual hunting above the ridge, most likely on swifts (<i>Alpus spp.</i>), House Martins (<i>Delichon urbicum</i>) or Barn Swallows (<i>Hirundo rustica</i>)
18.12.2017	Picnic site	7.555649° -8.518559°	1	unknown	unknown	12:00–13:00 – 1 individual was observed that was hunting low above the vegetation (probably on dragonflies)
Lanner Falcon (<i>Falco biarmicus abyssinicus</i>)						
27.11.2015	Yekepa	7.577121° -8.533847°	2	pair	adult	Early afternoon – A pair of Lanner Falcon was soaring up cca. above Yekepa centre/market and drifted away towards AML workshop place

Date	Site name	Coordinates	Nr	Sex	Age	Comment
01.12.2015	Yekepa	7.577121° -8.533847°	1	unknown	adult	08:00–08:30 – Passing not too high above the area obviously hunting
04.12.2015	Yekepa	7.577121° -8.533847°	2	pair	adult	08:39 – A pair is soaring low above the southwestern part of Yekepa and disappeared to southwest direction obviously hunting
06.12.2016	Yekepa	7.577121° -8.533847°	2	pair	adult	14:40 – Soaring in pairs, the male displaying. At 15:30 – the male returned again.
14.12.2017	EA area, Yekepa	7.581038° -8.534307°	2	pair	adult	08:30 – 2 adult lanners (a pair) just outside of EA area: one is feeding on a prey on a high branch of a tall tree and its mate perching just a few metres away on the same tree
16.12.2017	Picnic site	7.555649° -8.518559°	3	pair / unknown	adult / immature	11:40 – An adult pair and an immature (2cy) individual were observed chatting with each other, soaring and stooping into the valley between the Picnic site and Nimba top (CellCom tower) – one lanner soared up later
18.12.2017	Picnic site	7.555649° -8.518559°	2	pair	adult	11:00–11:20 – The male of a pair lanners was mobbing a European Honey Buzzard; the female came later, and both lanners soared up towards NW to return later at very high altitude seemingly catching dragonflies
(African) Peregrine Falcon (<i>Falco peregrinus minor</i>)						
28.11.2015	LiberCell	7.535047° -8.527079°	1	female	adult	11:24 – Gliding down along the slopes (on Camp Four side) from Community tower towards Picnic site then stooping to the other side of the hill between LiberCell and Picnic site partly between the large trees attacking flock of swallows on the other side of the hill. Close to the observers when appeared. Not shy, it could be observed from close range. Not seen again, no proof of successful hunting
10.12.2015	LiberCell	7.535047° -8.527079°	1	female	adult	12:50–12:57 – One individual arrived from the direction of the CellCom tower at mid-altitude, then (maybe because of realizing the presence of observers) started to soar up and left towards CellCom tower
11.12.2015	LiberCell	7.535047° -8.527079°	1	male	adult	11:45 – A soaring adult male above the area between LiberCell and Picnic site. Slowly drifting away while soaring towards Guinea border above the valley between Picnic site and Blue Lake
15.12.2016	Picnic site	7.555649° -8.518559°	1	unknown	unknown	10:10 – Stooping very fast across the airspace above the site and disappeared in the valley

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