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Full Length Research Paper

Assessment of bird strike occurrences and bird species abundance at the Murtala Muhammed International Airport, Lagos

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This study assessed the abundance and activities of various bird species as well as the rate of bird strike occurrences at the Murtala Muhammed International Airport (MMIA), Lagos. Line transect survey was used to generate data for ecological analysis. Information on trend in bird strike occurrence in Nigeria aerodrome (1990-2002) was collected from Nigerian Civil Aviation Authority. A total of 36 species representing 22 families were recorded during the study, while a high value of 0.8684 calculated for the Simpson's Index of Diversity, indicated a richness of bird species at the MMIA. However, individual birds were not evenly distributed as seen among the species as seen in the value (0.2) calculated for equitability (E_D). A total of 45 cases of bird strike were recorded between 1990 and 2002, while Cattle Egret *Bulbulcus ibis* recorded the highest abundance of individual as well as the highest cause of bird strike in MMIA.

Keywords: Bird strike, MMIA, diversity.

INTRODUCTION

Birds in their diversity constitute part of the natural environment and play functional role such as agents of flower pollination and seed dispersal, sources of food chain and agents in breaking seed dormancy (Nason, 1992).As described by Nason (1992) birds are highly specialized flying machines, and their ability to fly allows them to range widely in search of food and escape predators easily.

The invention of airplanes, which was a fundamental turning point in history, came into being about a century years ago from the principles of avian flight. The success of the aircraft invention and the consequent improvements upon it brought about more technological changes. Before the advent of aircraft, birds, bats and insects used the skies. Sharing the skies and the environment with aircraft has often times resulted in collision of aircrafts, wildlife and birds. Most airstrips were constructed on lands formerly inhabited by or acting as passages to wildlife. With the invention of aircraft and airstrips also came aircraft accidents, the causes of which can be grouped into unfavourable weather condition, mechanical malfunctions, human error, terrorist act, and wildlife and bird interference.

Birds have been recognized as hazard to aircraft from the beginning of aviation (Bird Strike Committee USA 2002). The main problem being the collision between birds and aircraft or the ingestion of birds into the engines of the aircraft: this phenomenon is widely known as Bird strike. Bird strike has posed threat ranging from cracked windshields, dented wind edges and minor fuselage damage to air crashes, since the first ever reported bird strike on September 7, 1905 when an Orville Wright ran into a flock of birds while flying near Dayton ,Ohio.

The International Federation of Airline Pilot Association (IFALPA), a body representing over 100,000 licensed airline professionals worldwide has become so concerned with the peril from bird strike that it recently

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upgraded this hazard to a category “A” safety hazard, the highest level of concern.

The occurrence of birds at airports varies according to habitat type, weather and the time of the day and the season of the year (Weisbein and Shy, 1999). Usually, the combination of several attractants, are responsible for the presence of birds at an airport. These include availability of food, water, loafing and breeding sites. Many airports support an abundance of food like seeds, grasses, shrubs, berries, earthworms, birds and small mammals to birds. Birds species like Sparrows, Finches, Weavers, Starlings, Doves and pigeons are attracted to seeds and berries while egrets are attracted to insects. Birds of preys are attracted to airport because rodents, small birds and other small animals that are harbored by tall poorly maintained grass stands or bush are present. Waste disposal practices by restaurant and airline flight kitchen, food vendors and other airport users make organic garbage available as foods to birds like crow, pigeon and gulls and other scavenging bird species. Fruiting trees may also attract frugivores species. Dump sites located near airports provide feeding and loafing sites

Nigeria with her rich bird species and diversity and with a total of 904 species so far recorded does not have a good aviation safety track record of bird strike incidences. One of the very few cases is the Pan African News Agency report of the 29th of September 2001 of a bird strike incidence caused by some egrets at the Lagos Airport. Prevention of bird strike begins at the Airport because over 80% of the bird strike incidents occur in airports environment during take off, final climb, approach landing and taxi phases of flight (Dolbeer and Bucknal, 1994).

Due to the little information of bird strike occurrence in the airports in Nigeria, it is difficult to establish risk to life and wildlife that may exist due to bird strike. The 20 airports in Nigeria handle a capacity of 15,000 passenger’s traffic daily, 52% of which is handled by the Murtala Mohammed International Airport (MMIA) daily. This study was designed to- obtain information on the presence, abundance, activities of various birds and rate of bird strike occurrences at the MMIA.

MATERIALS AND METHODS

Study Area

Murtala Mohammed International Airport (MMIA) lies 18km northwest of metropolitan Lagos. The airport which covers a total area of about 1.5 hectares is bounded by residential areas namely Mangoro to the north, Isolo to the south, Mafolouku / Oshodi to the east and Shasha to west. The Airport lies on latitude 6 34 29 and longitude 3 19 07.It occupies a portion of the Ikeja plains, a fairly well drained expanse of land located at an elevation of 135 feet above sea level. The temperature of MMIA is highest during the dry season and lowest during the rainy season with the mean daily maximum temperature ranging between 32.9 c and 27.8c and the mean daily minimum temperature ranging between 23.2 c and 21.5 c. The aerodrome reference temperature is 31.3c, mean annual rainfall is approximately 1565mm and relative humidity is usually over 80%.

METHODS

Some of the basic methods used in bird census as described by Bibby et al. (1992) are: Point counts: to determine abundance by undertaking a bird count from a fixed location (selected systematically or randomly) for a fixed period of time. The bird species seen or heard are recorded.

Line transect: Suitable for estimating density and abundance which involves moving along a fixed route (transect) and recording the bird species seen and heard on both sides of the transect.

Territorial mapping: this involves the use of breeding territory in which all signs of territorial occupancies are marked on a large-scale map of the plot as a census tool.

The study was conducted between September and November 2002. The abundance and distribution of birds species was surveyed using the 5 randomly located accessible routes (transects) carefully selected from a drawn layout of the airport. Two of the other routes selected could not be used due to security reasons. Of the five transects, three were of 1000m in length and two of 800m. Four of the five transects were surveyed twice. Bird counts were carried out in the mornings between 7.30am and 11.30am. Each transect was walked at a set pace of 200/10mins to record the bird species heard or seen. A pair of 10 by 40 binoculars was used to confirm the identification of the birds located by sight. For every bird seen, the following parameters were recorded:

- activity of the bird when first sighted,
- the number of bird species at every sighting and the breeding status where possible,
- where nest were observed, located , species involved , position from the ground and the number were noted,
- other animals encountered during the cause of the survey were also recorded since they play a key role in the food chain/web for the birds in the area.

Records of bird strikes in Nigerian Aerodromes, the dates and places of occurrence, operators of airlines involved and aircraft classification were collated from October 1990 to August 2000 from Bird Strike statistics summary of the Nigerian Civil Aviation Authority. This was supplemented by Newspaper reports.

Operators of Freedom, Sosoliso, Transahara airlines and FAAN operations department were interviewed on occurrences of bird strikes with their aircrafts. The bird

Table 1. Activities of bird species at MMIA

Activities of bird species	Frequency %
Loafing	78
Breeding	17
Feeding	5

Table 2. Bird nest recorded at MMIA

Bird species	Nest condition	No of nest	No of birds recorded at nest
Bird of prey	Old	1	-
Ploceus species	New	1	Not accessible
Ploceus cucullatus	Old and New	180	110

Table 3. Bird species that are responsible for bird strike at MMIA

Species causing bird strike	Frequency %
Milvus migran	34
Corvus albus	8
Bubulcus ibis	24
Ciconia abdimii	12
Sparrows	22

control officer was interviewed on measures taken by MMIA management in controlling bird strike at the airport. The staff of the apron services unit were also interviewed on the maintenance and cleaning of the airport environment.

DATA ANALYSIS

a) Species composition: abundance for each species was calculated by summing up the number of individuals recorded in all the transects.
b) Species diversity: using Simpson index (D), Simpson Diversity Index (1-D),Simpson's Reciprocal Index (1/D), Species richness (S) and Equitability or Evenness (E_D) .
c) Activities of birds recorded during the survey period included perching, walking, calling, over flying, mobbing, collection of grass materials, feeding and loafing. The frequency of each activity was summed up to give the activity rating and the percentage values of the frequency of each activity group were calculated.

RESULT AND DISCUSSION

A total of 36 species distributed in 20 families were recorded during the survey period (Appendix 1). Fifteen families were represented only by one species each. Cattle Egret *Bulbulcus ibis* was the most abundant species (with 284 individuals) followed by Village Weavers *Ploceus cucullatus* (with 198 individuals).

The Simpson's index that gives the probability that two randomly selected individuals in the community belongs to the same category gives 0.1316, and the Simpson's diversity Index of 0.8684 which shows the probability that two randomly selected individuals in a community belongs to different species. A value of 7.6 was obtained as the reciprocal of Simpson index, equitability or evenness gives 0.2111 and the total number of 36 species was recorded during the survey.

Activities of bird species in Table 1 shows that 78% of the birds were loafing while 17% and 5% were breeding and feeding respectively.

A total of 182 nest belonging to 2 families were recorded. Of these, the Village weaver *Ploceus cucullatus* had nest count of 180 but not all of them are accessible (Table 2). The annual rate of reported cases of bird strike in the airspace between 1990 to 2002 is 3.46 strikes per year. MMIA recorded the highest incidence in the year 2001. No bird strike was reported in 1994 and 1999.

Table 3 shows that Black Kites *Milvus migrant (*34%), Cattle Egret *Bubulcus ibis (24%)* and Sparrows (22%) were the bird species that are responsible for the reported bird strike occurrences in MMIA while the

effect of two other species, the Abdim's stork *Ciconia abdimii* (12%), Pied crow *Corvus albus* (8%) were not significant.

The effects of bird strike occurrences at MMIA shows that 45 incidences were reported but information on 33 cases was not provided. However, aborted takeoffs (44%), engine shutdown (31%) and pre-cautionary landing (25%) were the major effects of bird strike.

CONCLUSION

The value of 0.1316 obtained for the Simpson's index shows a low probability that two individual drawn at random will be of the same species. The high value of the Simpson's index of diversity (0.8684) is an indication of the richness in bird species at MMIA.

The value of 0.2111 calculated for Equitability or Evenness of individual distribution (E_D) among the species (recall that a value between 0 and 1, and 1 is complete Equitability).

The Cattle Egret recorded the highest abundance and incidentally was recorded as highest cause of bird strikes. The bird was described by Nason, (1992) as having successfully adapted its habit to fit in with that of man. The increase in bird strike rate in 2002 as compared to the previous years despite the introduction of Bird Control Program might be attributed to the fact that the dumpsites, standing waters, tall and seeding grasses, insects, frogs and other animals still provide the basic feeding and habitat requirements of these bird species. The implication of this is that bird hazard control around airports would be better concentrated on the most abundant and problematic species such as the Cattle Egret.

The month of December recorded the highest number of incidences for MMIA between 1990 and 2002, an indication of the possibility of threats posed by migrant species such as the Abdim Stork *Ciconia abdimii,* an intra-african migrant and the Yellow Wagtails *Montacilla flava,* a Palaearctic migrants during this period.`

This suggests a need for the adoption of Buurma's (2001) Three Phase Model of Bird Strike Prevention where a combination of habitat manipulation, bird control and bird avoidance was proposed for any effective aerodrome bird control program.

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APPENDIX 1

BIRD SURVEY RESULT

ARDEIDAE	Scientific Names		Frequency
Cattle Egret	*Bubulcus ibis*	CTEG	284
CICONIIDAE			
Abdim's Stork	*Ciconia abdimii*	ABST	1
ACCIPITRIDAE			
Black-shouldered Kite	*Elanus caeruleus*	BSKT	4
Black Kite	*Milvus migrans*	BTKK	19
Shikra	*Accipiter badius*	SHKR	4
Marsh Harrier	*Circus aeruginosus*	MSHE	2
Lizard Buzzard	*Kaupifalco monogrammicus*	LZBZ	1
FALCONIDAE			
Common Kestrel	*Falco tinnunculus*	CMKS	4
PHASIANIDAE			
Double-spurred Francolin	*Francolinus bicalcaratus*	DSFN	8
COLUMBIDAE			
African Green Pigeon	*Treron calva*	GNPG	2
Tambourine Dove	*Turtur typanistria*	TBDV	3
Blue spotted wood Dove	*Turtur afer*	BSWD	1
Red-eyed Dove	*Streptopelia semitorquata*	REDV	46
Laughing Dove	*Streptopelia senegalensis*	LGDV	55
CUCULIDAE			
Senegal Coucal	*Centropus senegalensis*	SGCL	5
APODIDAE			
African Palm Swift	*Cypsiurus parvus*	APST	71
Little Swift	*Apus affinis*	LTSW	23
ALCEDINIDAE			
Woodland Kingfisher	*Halcyon senegalensis*	SGKF	4
MOTACILIDAE			
Yellow Wagtails	*Motacilla flava*	YLWT	57
African Pied Wagtail	*Motacilla aguimp*	PDWT	4
Yellow- throated Longclaw	*Macronyx croceus*	YTLC	5
PYCNONOTIDAE			
Common Bulbul	*Pycnonotus barbatus*	CGBB	73
TURDIDAE			
African Thrush	*Turdus pelios*	AFTH	13
SYLVIIDAE			
Winding Cisticola	*Cisticola galactotes*	WDCT	5
Grey-backed Camaroptera	*Camaroptera brevicaudata*	GBCP	11
NECTARINNIDAE			
Olive Sunbird	*Nectarinia olivacea*	OLSB	3
Green-headed Sunbird	*Nectarinia verticalis*	GHSB	1
LANNIIDAE			
Yellow-billed Shrike	*Corvinella corvina*	YBSK	5
CORVIDAE			
Pied Crow	*Corvus albus*	PDCW	105
PASSERIDAE			
Grey-headed Sparrow	*Passer griseus*	GHSP	14
PLOCEIDAE			
Village Weaver	*Ploceus cucullatus*	VGWV	198
Red Bishop	*Euplectes orix*	RDBP	10
ELSTRILDIDAE			
Orange-cheeked Waxbill	*Elstrilda melpoda*	OCWW	1
Black and White Mannikin	*Lonchura bicolor*	BWMN	32
Bar-breasted fire- finch	*Lagonosticta rufopicta*	BBFF	2
VIDUIDAE			
Pin-tailed Whydah	*Vidua macroura*	PTWD	1