

## HABITAT SURVEY FOR RECOGNIZING BIRD ATTRACTANTS AROUND BENAZIR BHUTTO INTERNATIONAL AIRPORT, ISLAMABAD, PAKISTAN

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**ABSTRACT:-** Habitats around airfields that attract bird species, pose serious threat to aviation industry. Habitat survey for recognizing bird attractants and hazardous bird species was carried out at 8 selected study sites within 8 km radius of Benazir Bhutto International Airport (BBIA), Islamabad. Each site represented a different habitat and was ranked for the presence of bird attracting sites using Habitat Composite Index (HCI). Habitat representing naturally preserved recreational area (Ayub Park) showed highest rank (9.7) for the presence of bird attracting sites followed by commercial habitat ranking (6), habitat near water bodies and landfill sites (5.6), followed by habitat with old buildings as dominant feature (4), landfill sites (2.9) habitat near sport ground (1.8), however bird score of these two sites, was 2 and 3, respectively. Habitat representing modern housing society with covered trash transfer facility (with rank, 1.3) had least bird attracting sites. About 64 plant species and 34 bird species were recorded during the survey. Results indicated that habitat near BBIA is highly conducive for bird activity which in return is a serious safety concern for aircraft operation. Outcome of this study could be incorporated into off airfield bird management programme for monitoring bird activity and land use practices around the airfield.

*Key Words: Bird; Survey; Habitat; Plant; Bird Attractants; Benazir Bhutto International Airport; Pakistan.*

### INTRODUCTION

Bird strike (bird and aircraft collision) is a serious and growing hazard to aviation industry throughout the world (DeVault et al., 2013). These strikes mainly occur at and around airports posing serious threat to aircraft operations (Thorpe, 2003). Benazir Bhutto International Airport, Islamabad; BBIA, (previously called Islamabad International Airport) is the third largest airport of the country and is located in the fourth most populous city of Rawalpindi in Pakistan. The areas in the vicinity of the airport

provide ample feeding, nesting and roosting sites to birds, many of which are potentially hazardous to aircraft operations. Since no two airports are exactly identical (Godin, 1994) therefore, bird hazards vary from airport to airport, which raises the need to analyse the habitats around airports.

Ninety-seven percent of all wildlife strikes with aircraft are caused by birds and approximately 74% of wildlife strikes occur in the airport environment i.e., at or below 152 m above ground level (Dolbeer, 2006; Dolbeer et al., 2011). Cleary and Dolbeer (2005) have reported

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that most of the strikes took place in the surroundings of airports and during landing and takeoff phases in USA. Thus, for better management practices that reduce bird abundance, it is essential to explore surrounding areas of an airfield to identify factors contributing in bird strike problem.

A number of factors have been identified as bird attractants near airports. Birds are attracted to airports because of availability of food, water and shelter. One of the basic principles in reducing bird strike hazards is to identify these attractants. Usually, many attractants acting in combination are responsible for birds' prevalence in the vicinity of airports. One of the major attractant at or around airports is water. Birds are attracted to water for drinking, bathing, feeding, loafing, roosting and protection (Wright, 1968). Burger (1983) reported that landfills have also been proven to contribute to the bird strike by offering feeding resources and loafing sites to many bird species such as gulls, vultures, kites and egrets. Washburn (2007) also reported that traditional waste landfills in USA were very attractive to bird species such as gulls, European starlings, rock pigeon, and crows.

Areas in the vicinity of airports that may include natural or modified environments such as wetlands (ponds, rivers, streams, ditches and reservoirs), dumping sites, agricultural lands and forests may contain bird attractants. These areas provide roosting, breeding and feeding sites to bird species. Although birds spend most of the time in the vicinity of the airport, however there are periods of activity, when these birds will cross the airfield to reach to their resource and thus may encounter with air-

craft. Therefore surrounding areas of the airfield should also be monitored for bird activity (ATSB, 2002). Different studies have been conducted at and around the airfields to assess the attractiveness of habitats for bird species. Matthew et al. (1998) in a survey around the aerodromes of Trivandrum, Cochin, Calicut, Mangalore and Ramnad, India found that habitat around these aerodromes had many attractants such as animal waste, garbage and other food items which attracted kites (*Milvus migrans*).

Servoss et al. (2000) assessed habitat characteristic, wildlife abundance, distribution and movement patterns at Phoenix Sky Harbor International Airport (PHX) and within an 8-km radius of this airport and found that water sources at or near PHX pose threat to aircraft operation. Suggesting reduction in the bird hazard levels at and around the airport, they focused mainly on four approaches i.e., habitat modification, exclusion, behavior modification and population reduction.

Upadhyaya and Dolbeer (2001) analyzed the habitat at and around Tribhuvan International Airport (TIA) Nepal, and found that the rapidly growing urban habitat around the airfield offered many sites which attracted bird species including raptors and other birds. Polluted rivers, shops, markets, poor sanitation conditions were the factors which attracted hazardous bird species in the vicinity of TIA.

According to International Civil Aviation Organization (ICAO, 2012), any significant bird or wildlife attractant falling within 13 km radius of an aerodrome, should be assessed to reduce its attractiveness to birds. Thus main objective of this study was

identification of potential bird attracting sites, which become cause of bird assemblage, at and in the vicinity of BBIA, Islamabad.

## MATERIALS AND METHOD

### Site Description

To explore land use practices in relation to bird population and bird use pattern, it was important to characterize habitat in the vicinity of Benazir Bhutto International Airport. Habitat survey was conducted following Servoss et al. (2000). Stratified sampling was used for site selection. Data were collected from eight randomly selected study sites, located in the vicinity of the airport within 8-10 km radius. These sites were chosen to sample key habitats around BBIA. Sites 1 (Mall road) and site 2 (Saddar), located in the northwest direction of the airport, represented commercial habitats, site 3 (Ayub National Park) symbolized naturally preserved recreational area, site 4 (Kachehri chowk) was taken as an area with buildings having old pine and eucalyptus plantation, site 5 (Soan bridge) was marked to indicate habitat around a water body i.e., Soan river. Site 6 represented sports ground (KRL road), site 7 represented landfill site for solid waste adjacent to airport boundary (runway 30 end), site 8 (Bahria Town, Phase 8) represented an area with well-planned housing colonies and proper garbage disposal system.

### Data Collection

The habitat of each study site was assessed on the basis of presence of agricultural activity at these sites, commercial and recreational land use, waste management, water sources, nesting, loafing, roosting and

feeding area (Cleary and Dolbeer, 2005). Data sheets were used to score habitat type of each study site, following U. S. Department of Agriculture Manual on Wildlife Hazard Management at Airports (Cleary et al., 1999). A vantage point was selected at each study site and observations were recorded in 50 m radius of that point in each study site. Though, all sites were different in size, however, study was confined to only 50 m radius (Verner, 1985) and only one vantage point at each site was selected. Scoring ranged from 0-3 (Table 1). Each site was visited monthly during 2013-14. Most of the observations were made between 0600h and 1930h (time was convenient for data collection). Vegetation present at each study site was also recorded. Samples of unknown plant species were collected and were got identified by the Department of Forestry and Range Management, PMAS-Arid Agriculture University, Rawalpindi.

Birds present at each survey site were recorded. Binoculars were used to identify questionable birds and to verify species. Identification of bird species was done following Roberts (1991; 1992) Mirza (2007) and Pyhala (2001) as well as by consulting ornithologist from National History Museum, WWF (Pakistan), PMAS-Arid Agriculture University, Rawalpindi.

### Habitat Index

Habitat Index (HI) for each study site was calculated using following equation:

$$HI = \frac{xi - xi(min)}{xi(max) - xi(min)}$$

Then, Habitat Composite Index (HCI) was calculated using following equation:

**Table 1. Habitat Index (HI) of each site for habitat analysis**

Study Sites	1	2	3	4	5	6	7	8
<b>Agriculture/especially grains</b>								
Aquaculture facility	0	0	0.33	0	0	0	0	0
Livestock feed lots	0	0	0	0	0.2	0	0	0
Grain storage/grain mills	0	0	0	0	0	0	0	0
<b>Commercial/recreational land use</b>								
Restaurants (especially outdoor eating areas)	1	1	0.67	0.5	0.4	0	0.43	0.125
Picnic areas, parks	1	0	1	0	0	0	0	0.125
Golf course/sports ground	0	0	1	0	0	0.5	0	0.125
Building used for nesting's/perching	1	1	0.67	0.75	0.6	0.33	0.29	0.125
<b>Waste management</b>								
Garbage dumps	0.67	0.67	0.33	0.75	0.6	0.33	0.43	0
Garbage transfer stations	0	0	0	0	0.6	0	0.43	0
<b>Water sources</b>								
Retention ponds/pools	0.33	0.607	0	0	0	0	0	0.125
Streams, ditches	0	0	0.67	0.5	0.6	0	0.43	0.125
Reservoirs, lakes, natural ponds	0	0	0.67	0	0.6	0	0	0.125
Water supply ponds	0	0	0	0	0	0	0	0
<b>Nesting/loafing/roosting, feeding areas</b>								
Natural preserves	0	0	1	0	0.4	0	0	0.125
Nesting sites	1	0.67	1	0.75	0.6	0.33	0.29	0.125
Roosting sites	1	0.67	1	0.75	0.6	0.33	0.29	0.125
Marshes/swamps, mud flats	0	0	0.67	0	0.4	0	0.29	0
<b>Habitat Composite Index (HCI)</b>	<b>6</b>	<b>4</b>	<b>9.67</b>	<b>4</b>	<b>5.6</b>	<b>1.83</b>	<b>2.86</b>	<b>1.25</b>

$$HCI = \frac{\sum_{x=1}^{17} xi - xi(min)}{xi(max) - xi(min)}$$

where,  
 $xi$  = Base value  
 $xi(min)$  = Minimum score value in the respective habitat  
 $xi(max)$  = Maximum score value in the respective habitat.

Statistical analyses were performed using the SPSS version 22.0. P<0.01 and P<0.05 was considered to indicate a statistically significant difference.

**RESULTS AND DISCUSSION**

Birds' prevalence near airports is a serious safety concern for aircraft (Burger, 1983). BBIA, Islamabad is situated in an area with many bird attracting sites in its vicinity like natural vegetation, open garbage dumps,

water bodies commercial areas. About 64 plant species and 36 bird species were recorded at 8 selected study sites during the habitat survey carried out in the vicinity of BBIA. Ranking of habitat of each study site on the basis of Habitat Index (HI) suggested that site 3, (naturally preserved recreational area of Ayub Park), located at the aerial distance of 4.5 km from the airport, showed highest score for bird attracting sites (Table 3) thus creating possible potential problems to aircraft operations at BBIA and also to military airbase Dhamiyal (Table 1 & 2). High vegetation density of the area attracted birds mainly kites (*Milvus migrans*) thus, creating potential problem to aircraft operations. The area should be monitored for bird activity. Second most supportive habitat for kites was commercial area of site 1 (Mall road) having hotels, restaurants, wedding halls and buildings and structures providing nesting, roosting and feeding areas. Trash transfer station located at Site 5 also attracted birds like kites, egrets (*Egretta alba*), myna (*Acridotheres tristis*), sparrow (*Passer domesticus*) and crow (*Corvus splendens*), providing abundant feeding sources to these birds that may become threatening for flight operations. Commercial habitat of site 2 (Saddar) with markets, shops, plazas open and garbage dumps and habitat of site 4 (Kachehri Chowk) with old buildings and tall trees are at the same level in ranking table Old pine trees present at site 4 are habitat for kite (*Milvus migrans*) which is the main hazardous bird species of this area. Landfill site located at site 7 across the boundary of 30 end of runway at the distance of 200 m was most critical for its attractiveness for

**Table 2. Bird Score for each study site**

Study Sites	Bird Score
1. Mall Road	3
2. Saddar	3
3. Ayub Park	3
4. Kachehri Chowk	3
5. Soan bridge	2
6. KRL Road	2
7. 30 end	3
8. Bahria Phase 8	1

0= not present; 1= present but no bird problem noted or anticipated; 2= site attracts some hazardous birds creating possible or potential problem, site should be monitored; 3= site has significant bird number that may become hazardous for aircraft operation.

problem bird species. Though ranking score of habitat of sites 6 and 7 is 1.8 and 2.9 (Table 1) however, birds' score of these areas (Table 2) is critical as these sites fall underneath the landing path of the aircraft, creating potential threat to aircraft. Open garbage dumps present at these sites should be removed on priority basis and the sites should be monitored for bird activity. Site 8 scored least for the attractiveness for birds especially kites; probably due to cover trash transfer facilitates, no severe problem has been anticipated at this site. However, this trend could change over the years with rise in human population and development of more houses and commercial areas. Similar practices could be applied to other areas in the city. Covered trash collection points would reduce the number of birds that feed on household garbage.

Presence of hotels, wedding halls, restaurants, recreational areas on

**Table 3. Ranking of different habitats on the basis of HCI score**

HCI score	Study sites	Aerial distance from the airport (km)	Habitat	Characteristics
9.7	3	5	Naturally preserved habitat	Vegetation, Lake, Picnic areas, Eating areas
6.0	1	4.5	Commercial habitat	Hotels, mess, public park, old pine trees
5.6	5	6.5	Habitat near water body and landfill site	Bridge, river bank, trash transfer facility, Buffalo keeping, plant nurseries
4.0	2, 4	4,4.5	Commercial habitat, Building with old trees	Shops, plazas, restaurants, vacant lots garbage, old plantation
2.9	7	0.2	Landfill site	Trash transfer site
1.8	6	0.5	Habitat near sports ground	Sports ground, garbage, eucalyptus tree
1.3	8	9	Modern housing society	Vegetation, covered trash transfer facility

Mall road sports grounds, golf clubs near Ayub Park and building with old plantation of pine trees at Fatima Jinnah University and near Kachehri chowk attracted bird species (kites) and offered ample sites for nesting feeding and roosting. Commercial area of Saddar with many shops, markets vacant lots and improper garbage disposal system attracted bird species mainly kites (*Milvus migrans*) which were attracted to food available in the numerous garbage dumps. Similar bird problem has been reported (Matthew et al., 1998) in aerodromes of India where *Milvus migrans* were reported to be numerous and hazardous for aircraft operation and were attracted to huge quantity of food available in waste thrown out of slaughter houses and garbage dumps in the vicinity of Indian aerodromes. Studies at Tribhuvan international airport, Nepal also suggested that birds of prey were major hazardous bird species, which

were attracted to solid waste dumping site, nearby jungle area providing nesting and roosting sites, and garbage filling station near river bank in the close vicinity (Upadhyaya and Dolbeer, 2001). Water bodies in the surrounding area of BBIA which include ponds, ditches, stream, marshes, lake and reservoirs originating out of Lai, Soan and Korang river also serve as bird attracting sites and provide ample food to problem bird species. Special attention should be paid in these areas to monitor bird activity. Open garbage dumps in the vicinity of airport and trash transfer station located under Soan bridge and at the landing site near runway 30 end are of serious safety concern. Control measures should be taken by the authorities for controlling off airfield situation that may become unsafe for aircraft movement.

Habitat near BBIA is highly conducive for bird activity which in return is a serious safety concern for

aircraft operation. Naturally preserved recreational areas, commercial habitats, habitat near water bodies, landfill sites, housing societies and buildings with tall tree plantation showed abundance and diversity of plants and birds, thus creating possible potential threat, to aircraft operations at BBIA. Airport authorities give more attention to bird control practices at the airport environment, however off airfield monitoring of bird attracting sites must also not be ignored. It has been observed that the birds like kites, crows, myna and egrets were feeding on open garbage dumps scattered all around the airport. Measures should be taken by the district, provincial and federal governments and other relevant agencies responsible to remove garbage accumulation in the surroundings of BBIA, especially at site 6 (near runway 30 end) site 7 (KRL road) which are directly under the flight path of the aircraft. Tree plantation at and around the airport should be carefully done keeping in mind their attractiveness for birds. Bird behavior, feeding habits, nesting and roosting preferences and knowledge about breeding cycle could also provide a clue for devising control measures for these birds.

Pakistan being a member of International Civil Aviation Organization has an obligation to adopt measures necessary for discouraging the presence of birds in the vicinity of airport for smooth aircraft operations (ICAO, 2012). The national legislation also prohibits any activity that attracts birds within 8 km around an aerodrome. All concerned departments like airport bird control unit, Civil Aviation Authority, Pakistan Air Force, local municipal administration

and law enforcement agencies must work together in harmony to ensure public safety of all those who travel in Pakistan fly zone.

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#### AUTHORSHIP AND CONTRIBUTION DECLARATION

S. No.	Author Name	Contribution to the paper
1.	Dr. Sameera Arshad	Conceived the idea, Data collection, Data entry and analysis, wrote the article
2.	Dr. Iftikhar Hussain	Technical input at every step

**HABITAT SURVEY FOR RECOGNIZING BIRD ATTRACTANTS**

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3.	Dr. Maqsood Anwar	Overall management of the article
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