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Research Article

Diurnal activity and occurrence frequency of birds according to density during the breeding season at Heydar Aliyev International Airport

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Abstract
In 2023–2025, diurnal activity patterns and occurrence frequency of migratory-breeding and sedentary bird species were studied at the Heydar Aliyev International Airport. During the study period, 28 species belonging to 8 orders, 18 families, and 23 genera were recorded. Of these, 27 species were observed during daylight hours, while one Little owl (*Athene noctua*) was recorded at night. The main peak of bird activity occurred between 06:00-11:00 (27 species) and 19:00–21:00 (22 species), whereas the lowest activity was observed between 11:0-–18:00. Based on species density, seven species with an occurence frequency rated at 80–100 points-Glossy ibis (*Plegadis falcinellus*), Great black-headed gull (*Larus ichthyaetus*), Caspian gull (*Larus cachinnans*), Common gull (*Larus canus*), Rock dove (*Columba livia*), Common starling (*Sturnus vulgaris*), and Hooded crow (Corvus cornix) pose a high risk of collision with aircraft due to their flocking behavior, collision probability, and potential strike severity. By assessing bird activity and occurrence frequency across the airport area and adjusting the daily operational schedules of aircraft accordingly, it is possible to reduce the risk of bird strikes posed by hazardous species.
Keywords: Breeding season, aviation safety, bird activity, strike risk, wildlife management at airports

Introduction
In recent years, the increasing flight speed of aircraft - one of the primary and fastest modes of transportation worldwide - and the growing intensity of aviation traffic have significantly elevated the likelihood of bird-aircraft collisions. In the modern era, the rapid expansion of turbojet aviation and the intensified low-altitude operations of both military and civilian aircraft create conditions that further increase the probability of such collisions, making this a critical safety concern. Under

these circumstances, avoiding collisions between rapidly moving, new-generation aircraft and birds flying at low and higher altitudes has become considerably more difficult.

Bird-aircraft strikes are influenced by various factors, including the natural geographical characteristics of the airport's location, the season of the year, and whether the collision risk occurs during daylight or nighttime hours. The growing frequency of bird strikes, the potential severity of the associated hazards, and the increasing extent of damage to aircraft are issues of significant concern. The engines of turbojet aircraft, which ingest large volumes of air under high pressure (fan blades rotating at 10,000–12,000 rpm), can easily draw birds inside, causing severe damage to valuable equipment (Cassidy, 1967). In addition to engine failure, bird strikes may inflict substantial damage on the aircraft's windshield, wings, forward fuselage, and other structural components. It has been documented that when a bird weighing 1.8 kg collides at an altitude of 2,400 meters with an aircraft traveling at 700 km/h, the force of impact is tripled and exceeds that of a 30-mm projectile (Cassidy, 1967).

According to the International Civil Aviation Organization, over the past seven years, 97,751 wildlife strikes involving aircraft have been reported across 105 countries. Approximately half of these incidents (56,093) resulted in more than USD 610 million in annual damage to aircraft (Колесников, 2007). In some cases, birds are capable of damaging even bullet-resistant cockpit windshields. Effective mitigation of hazardous bird activity at airports requires a detailed understanding of the daily activity patterns, aerodynamic behavior, and ecological characteristics of species that pose strike risks. In this regard, the installation of radar systems at airports enables the detection of migratory routes, occurence frequency, flight altitude, flight speed, and other relevant parameters of dangerous bird species. The use of radar technologies to investigate avian orientation and navigation patterns provides opportunities for early warning, implementation of preventive measures, and development of predictive assessments (Kolesnikov, 2007). Studying the navigation and orientation of migratory-breeding and sedentary bird species that pose threats to aircraft allows the identification of behavioral regularities and helps prevent potential disasters that may result in significant loss of human life.

Heydar Aliyev International Airport is located in the settlement of Bina, 20 km northeast of Baku, and is the largest international airport in the Caucasus region. The total area of the airport is 1,565.7 hectares, with a perimeter of approximately 27 km. The airport is protected by an electronic fence and is capable of operating aircraft of categories A, B, C, D, and E, as well as all types of

helicopters, landing on runway PCN 150 F/A/W/ SÖUEZ 3530–1730. The airport is situated 2 km from the Caspian Sea (Qadirzada & Taghiyev, 2024). Due to its position between numerous large and small lakes on the Absheron Peninsula and the Caspian Sea, the airport area provides conditions favorable for the short- and long-term use of various ecological groups of birds for feeding, resting, roosting, and sheltering during migration (Qadirzada & Taghiyev, 2024).

The airport operates two asphalt-concrete runways measuring 3.2 km and 4.0 km in length. To ensure ornithological safety along the 3.2-km runway, Canadian-manufactured MK-III acoustic deterrent systems and amplifiers are used. A total of 7 control units and 42 loudspeakers are installed along the 3.2-km runway, while 12 control units and 72 loudspeakers are placed along the 4.0-km runway. Each unit controls six loudspeakers, each with a broadcast radius of 750 meters. The distance between adjacent control units is 900 meters, and between loudspeakers, 300 meters. These devices emit predator bird calls and other technogenic deterrent sounds at regular intervals to drive birds away from the runways (Qadirzada, Taghiyev, & Qulu-zade, 2024).

Because Heydar Aliyev International Airport is located directly along major migration routes running north–south and west–east across the Absheron Peninsula, it is classified as a high-risk zone. Tens of thousands of birds migrating from Southeast Asian countries and Africa pass through the airport area during the breeding season, creating significant hazards for aircraft operations (Qadirzada & Taghiyev, 2025). Compared with the wintering season, the sharp increase in flight frequency during the breeding period (April–August) and the corresponding rise in the abundance of migratory-breeding birds greatly amplifies the risk level. Unfortunately, despite the rising global damage caused by bird strikes, modern methods for reducing such incidents at airports are still not widely evaluated or tested in practice. Effective wildlife management within and around airports must be developed using contemporary scientific approaches to prevent and reduce bird strike frequency. Investigating bird strikes and implementing risk-management strategies are essential for forecasting the severity of such events and minimizing their impacts.

Material and methods

Field studies were conducted at Heydar Aliyev International Airport during the spring and summer months (April–August) of 2022–2025. Surveys were carried out along predetermined transects, both on foot and by vehicle (at a speed of 20–30 km/h), between 06:00 and 21:00. The daily activity and occurence frequency (based on density) of migratory-breeding and sedentary birds belonging

to various ecological groups were assessed within the airport area, including natural biotopes, residential zones, and the runway environment. The species composition, abundance, and the use of the airport territory for different purposes (feeding, resting, roosting, shelter, etc.) were documented.

In areas inhabited by migratory-breeding and sedentary species, the influence of natural and anthropogenic factors on daily activity patterns and occurence frequency was evaluated with respect to their potential risk to aircraft. A 100-point scale was used to assess the hazard sensitivity of each species. For migratory-breeding species, the quantity and quality of available food resources within the airport area, availability of shelter sites, and the variability of food accessibility for different bird groups were taken into account.

During peak bird-activity hours, airport pilots provided real-time reports of hazardous bird presence near runways. Based on these alerts, trained ornithologist-hunters implemented mitigation procedures by firing warning shots into the air from the runway zone to disperse birds and remove them from flight paths.

Results and Discussion

Visibility distance is one of the major factors influencing bird–aircraft collisions. Such collisions primarily depend on both biological and technical factors. Biological factors include seasonal changes, daily activity rhythms of birds, peak activity hours of different species, population size, and the biological characteristics of species considered hazardous to aircraft. Technical factors include the traffic intensity of flights during daylight hours and the number of flights operating during the day and night. Although sedentary bird species have relatively stable daily activity patterns, during the breeding period, chicks leave the nest and immature individuals often migrate over short or moderate distances in search of food (Mustafayev & Sadigova, 2005). Alongside species that nest within the airport, many bird species use the area for various purposes such as feeding, resting, roosting, and shelter. During the breeding season, once fledglings become capable of flight, the formation of large flocks significantly increases the risk of bird strikes.

Species that use the airport area for roosting or shelter depart at dawn (with the first light) in flocks, small groups, pairs, or individually to forage at lakes across Absheron or at the Caspian Sea. These daily feeding flights represent a continuous source of hazard for aircraft operations.

During the breeding season, only one nocturnal raptor species from the order Strigiformes - the Little Owl (*Athene noctua*, 150–170 g)—was recorded as a threat to aircraft during nighttime operations. Airport reports confirmed one fatal strike involving this species, in which a carcass was found on the runway.

Occasional flights of swifts (order Apodiformes) were observed over the airport during evening and nighttime hours. It is important to note that long-distance migration of diurnal birds largely occurs at night, especially on clear, starry, or moonlit nights, which facilitate aerial orientation and navigation. However, when migrating birds occurence deteriorating weather—such as cloudy, foggy, or misty conditions—near the beginning, middle, or final segments of their migration route, the likelihood of bird–aircraft collisions increases. Clear and unobstructed skies allow birds to detect aircraft from greater distances, enabling them to avoid potential collisions in time.

During the breeding season, migratory-breeding and sedentary bird species belonging to the orders Ciconiiformes, Falconiformes, Charadriiformes, Columbiformes, and Passeriformes temporarily, briefly, or for extended periods inhabit the territory of the airport during daylight hours. Statistics on bird strikes recorded at Heydar Aliyev International Airport indicate that the majority of collisions occur on the runway during aircraft takeoff and landing, typically at altitudes of approximately 30–200 meters.

In the wetland area adjacent to the airport's electronic fence, one individual of the Purple Heron (*Ardea purpurea*, body mass 1000–1470 g) was observed on 09.04.2023 and 07.04.2025 within the reed–tamarisk swamp. Depending on short-distance feeding-related local flights, the daily activity of this species was registered between 06:00 and 11:00 (Table 1). The occurrence frequency based on density consisted of single individuals. Additionally, the presence of two Red foxes (*Vulpes vulpes*) recorded within the airport territory may occasionally induce local movements of this heron species throughout the day. During local foraging-related movements, the flight altitude of *A. purpurea* typically ranged between 30–50 meters. Given its body mass of 0.9–1.35 kg, this species poses a significant risk in terms of the force and hazard potential of bird–aircraft collisions (Qadirzada, Taghiyev & Qulu-zade, 2024).

Table 1. Diurnal activity and occurrence frequency of birds according to density during the breeding season at Heydar Aliyev international airport

№	Species	06^{00}-08^{00}	08^{00}-11^{00}	11^{00}-18^{00}	19^{00}-21^{00}	Frequency of occurrence according to species density	Assessment of occurrence frequency using a 100-point scale
1.	*Ardea purpurea*	+	+			solitary	0-20
2.	*Plegadis falcinellus*	+	+			Flock, small group	60-80, 80-100
3.	*Falco tinnunculus*	+	+	+	+	solitary	0-20
4.	*Circus aeruginosus*	+	+		+	solitary	0-20
5.	*Himantopus himantopus*	+	+			Small group	20-40
6.	*Calandrella brachydactyla*	+	+	+	+	Flock, solitary, small group	0-20, 20-40, 40-60, 60-80
7.	*Galerida cristata*	+	+	+	+	Flock, solitary, small group	0-20, 20-40, 40-60, 60-80
8.	*Melanocorypha calandra*	+	+	+	+	Flock, solitary, small group	0-20, 20-40, 40-60, 60-80
9.	*Larus ichthaetus*	+	+		+	Flock, small group	20-40, 40-60, 60-80, 80-100
10.	*Larus cachinnas*	+	+		+	Flock, small group	20-40, 40-60, 60-80, 80-100
11.	*Larus canus*	+	+		+	Flock, small group	20-40, 40-60, 60-80, 80-100
12.	*Columba livia*	+	+	+	+	Flock, small group, solitary	0-20, 20-40, 40-60, 60-80, 80-100
13.	*Spilopelia senegalensis*		+			solitary	0-20
14.	*Athene noctua*	+			+	solitary	0-20
15.	*Apus apus*	+	+	+	+	solitary	0-20
16.	*Apus melba*	+	+	+	+	solitary	0-20
17.	*Merops persicus*	+	+		+	solitary	0-20
18.	*Upupa epops*	+	+		+	solitary	0-20
19.	*Hirundo rustica*	+	+	+	+	solitary	0-20
20.	*Delichon urbicum*	+	+	+	+	solitary	0-20
21.	*Motasilla alba*	+	+		+	Flock, small group, solitary	0-20, 20-40, 40-60,
22.	*Motasilla flava*	+	+		+	Flock, small group, solitary	0-20, 20-40, 40-60
23.	*Sturnus vulgaris*	+	+		+	Flock, small group, solitary	0-20, 20-40, 40-60, 60-80, 80-100
24.	*Pastor roseus*	+	+			Flock	60-80
25.	*Corvus cornix*	+	+	+	+	Flock, small group, solitary	0-20, 20-40, 40-60,60-80
26.	*Turdus merula*	+	+			Solitary	0-20
27.	*Passer domesticus*	+	+		+	Flock, small group	40-60, 60-80
28.	*Passer montanus*	+	+		+	Flock, small group	40-60, 60-80, 80-100

Between 2023 and 2025, on April 13, 2024, *Plegadis falcinellus* (Glossy ibis; body mass 420–770 g), a species not typical for the airport area, was recorded in the wetland zone adjacent to the airport's electronic fence. Glossy ibises use this area as a temporary stopover site along their migration route, and when disturbed by natural or anthropogenic factors, they circle in the air and subsequently return to the site of previous occupancy. Along the migration route, the likelihood, impact force, and overall hazard of collisions with aircraft are high. Their daily activity occurs mainly during the morning hours (06:00–11:00) (Table 1). Based on density assessments, occurrence frequency is high and consists of flocks. In the flock we documented, 18–20 individuals were present; however, flock size for this species is often larger, and occurrence frequency may occur in large flocks or occasionally in smaller groups (Mustafayev & Sadıqova, 2011). When disturbed within the airport territory, the species typically flies short distances at heights of 30–50 m. Along their migratory pathway, flight altitudes range from 100–150 m or higher. High population density, high occurrence intensity, body mass of 530–800 g, strongly oriented linear flight trajectories, and weak aerial maneuverability when avoiding threats collectively increase the impact force and hazard of collisions with aircraft.

During the reproduction period, *Falco tinnunculus* (Common kestrel; body mass 200–300 g), belonging to the order Falconiformes, is represented in the airport area by 2–3 sedentary individuals, while the inclusion of migratory-breeding individuals increases the total number to 3–5. Single individuals are generally observed at heights of 20–30 m above ground level. Near the runway, collision risk arises when individuals hover while searching for prey or attack prey from the air. They are active during all daylight hours (06:00–21:00) and pose a threat to aircraft (Table 1). The occurrence frequency of individuals colliding with aircraft is low and consists of single birds. They are most frequently recorded near the runway. Based on bird-strike statistics at Heydar Aliyev International Airport, the Common Kestrel is among the species most frequently involved in aircraft collisions. Despite the species' high aerial maneuverability when evading danger, collisions with aircraft remain relatively common.

Circus aeruginosus (Western marsh harrier; body mass 500–750 g), although strongly attached to its breeding territory, frequently performs movements to forage within biotopes located near the runway. It is primarily active in the morning and evening (06:00–11:00 and 19:00–21:00), and occasionally throughout all daylight hours. Its foraging sites are situated 100–150 m from the runway. Occasionally, flights crossing over the runway have also been recorded. The species

demonstrates high aerial maneuverability when avoiding aircraft. Within the airport area, flight altitude ranges from 30 to 50 m above ground level.

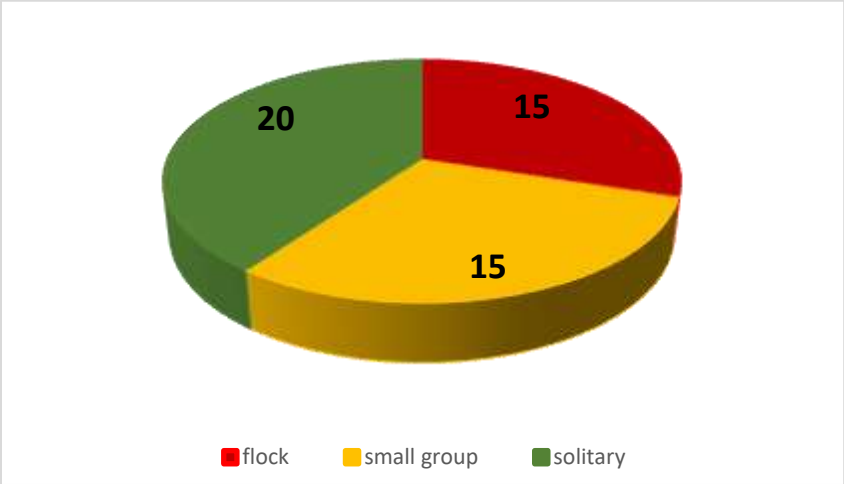

Figure 1. Occurrence frequency based on bird density during the breeding season at Heydar Aliyev International Airport.

Among the Charadriiformes, *Himantopus himantopus* (Black-winged stilt; body mass 180–220 g) was recorded within airport biotopes containing small ponds, willow thickets, and reed–swamp habitats (06:00–11:00). This is a migratory-breeding species, and individual numbers are low. Its aerial maneuverability when avoiding threats is weak, and its strongly linear flight pattern limits its ability to evade danger (Mustafayev, 2003). The severity of potential collisions is higher when the species occurs in small groups during migration, whereas single individuals pose relatively lower risk (Diagram 1). Within the airport's willow–reed swamp zone, the species is not active throughout the entire daylight period; individuals primarily forage in the water or rest. In other words, in the wetland habitats of the airport the species maintains a generally calm lifestyle. When disturbed, short-range local movements occur within the occupied biotope. These local displacements take place at sites located some distance away from the runway (Qadirzada & Taghiyev, 2025).

Calandrella brachydactyla (Greater short-toed lark; body mass 18–25 g) is more frequently encountered in flocks (Mustafayev & Sadıqova, 2010). During the breeding season it is active throughout the entire day within the airport territory (06:00–21:00), with peak activity observed in the morning and evening hours (Table 1). The species becomes a hazard to aircraft when crossing runways. Although a single bird poses little risk to aircraft engines or other components, collisions

involving flocks may present a greater level of danger. Within the study area, the species forms small groups and inhabits grasslands and areas with varied herbaceous cover. Flight height in the airport ranges from 10–50 m.

Galerida cristata (Crested lark; body mass 55–60 g) and *Melanocorypha calandra* (Calandra lark; body mass 44–66 g) primarily inhabit grasslands and herb-rich habitats near the runway. Both species are active throughout daylight hours (Mustafayev, 2003), with activity peaks in morning and evening and reduced activity at midday. They occur in small groups or flocks (Fig. 1). Occurence frequency within the airport is mainly in the form of flocks or small groups. Flights at 10–50 m above ground level are recorded in both flocking and small-group formations. They frequently move toward areas near the runway to feed. Although the body mass of each individual is low and does not pose a notable threat to aircraft, flock collisions may be relatively dangerous for aircraft engines (depending on the number of individuals ingested), but they are not considered hazardous for the cockpit windshield, wings, or the aircraft nose.

During the reproductive period, members of the family Laridae (Charadriiformes), including *Larus ichthyaetus* (Pallas's Gull; 1000–1400 g), *Larus cachinnans* (Caspian gull; 700–1200 g), and *Larus canus* (Common gull; 300–550 g), were recorded in reed–willow swamp biotopes, small ponds, near the airport fence in garbage disposal and drainage canal areas, and while crossing the runway in flight. Their daily activity depends on weather conditions (06:00–11:00 and 19:00–21:00) (Diagram 2). Throughout all study years, these gull species were observed primarily in small groups at garbage sites and drainage channels. On the Absheron Peninsula, when wind speeds exceeded 20 m/s, gulls were frequently observed throughout all daylight hours within the airport territory (Mustafayev & Sadıqova, 2011). Due to weak flock maneuverability, the probability of aircraft collisions is high. They are among the species posing real danger to aircraft at Heydar Aliyev International Airport. Within the airport area, they are mostly recorded flying at 20–50 m above ground level (Qadirzada, Taghiyev & Qulu-zade, 2024).

Among the Columbiformes, *Columba livia* (Rock dove; 265–380 g) regularly migrates from its roosting sites at the administrative buildings of the National Aviation Academy-located near the airport - to feeding areas within airport boundaries during spring and summer (Qadirzada & Taghiyev, 2025). Early morning hours represent the activity peak, and the species is observed near the runway in grasslands, herb-rich habitats, and above or below fruit trees (mulberry, fig, cherry, oleaster, olive, quince) and coniferous stands, either singly, in small groups, or in flocks (06:00–

21:00). The primary collision risk occurs during rapid flights over the runway. Although airport ornithologist-hunters fire warning shots to disperse them, individuals frequently return to their original sites within 3–5 minutes, as repeatedly documented. Within the airport's runway areas, they are observed flying at 30–50–100 m altitude.

Spilopelia senegalensis (Laughing dove; 90–130 g) was recorded once on the ground in a pine-covered area within the airport at 10:00–11:00 (Fig. 2). Among the Caprimulgiformes, *Apus apus* (Common swift; 95–110 g) and *Apus melba* (Alpine swift; 90–100 g) are abundant species within the area during the breeding season. They are observed flying at altitudes ranging from a few meters to over 100 m. Their flight altitude varies depending on weather conditions. They typically fly singly (06:00–21:00). Although collisions with aircraft are not uncommon, these species are not considered dangerous to aircraft. They exhibit high collision probability but low collision force and low hazard (Fig. 3).

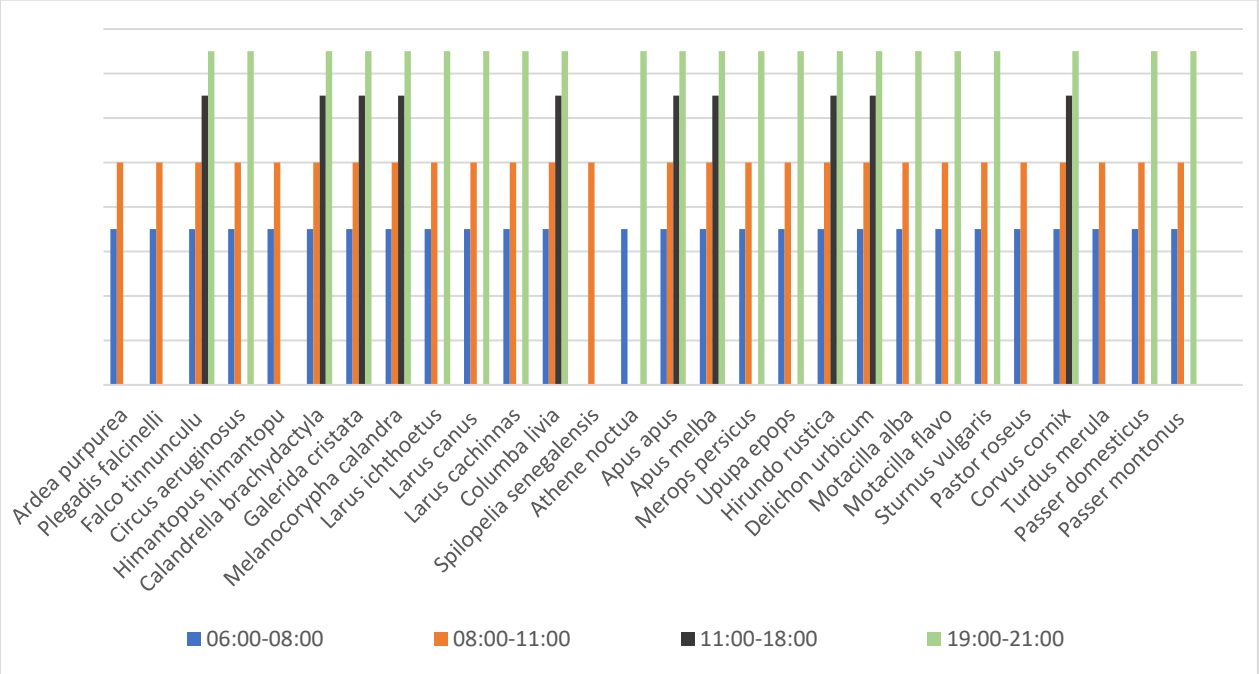

Figure 2. Daily activity patterns of birds during the breeding season at Heydar Aliyev International Airport (06:00-08:00, 08:00-11:00, 11:00-18:00, 19:00-21:00)

Within the reproductive period of birds, two individuals of *Merops persicus* (Green bee-eater; body mass 38–50 g) belonging to the order Coraciiformes were recorded in all study years. The species was observed between 06:00–11:00 and 19:00–21:00 in the willow–reed swamp area located some distance from the runway, as well as on the airport fence bordering residential areas.

The density of individuals within the airport territory consisted of solitary birds; correspondingly, the frequency of bird–aircraft encounters also involved single individuals. Due to its high maneuverability in flight, solitary occurrence, and low body mass, the severity and hazard of potential collisions are minimal.

Another representative of Coraciiformes, *Upupa epops* (Eurasian hoopoe; body mass 50–90 g), was recorded several times during the study period, mainly in the morning hours between 09:00–13:00.

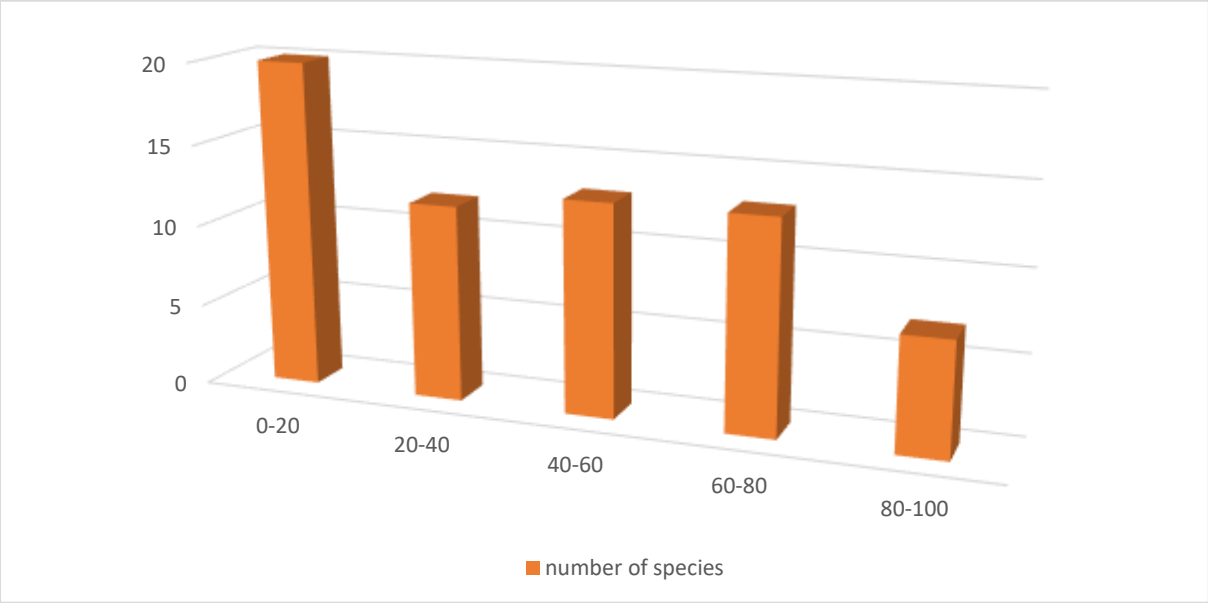

Figure 3. Evaluation of occurrence frequency based on bird density during the breeding season at Heydar Aliyev International Airport (100-point assessment system)

Among Passeriformes, *Hirundo rustica* (Barn swallow; 15–20 g) and *Delichon urbicum* (Common house martin; 15–22 g) were abundant species within the airport area. They were active throughout the daylight period (06:00–21:00), with peak activity occurring in the morning and evening (activity declined when air temperature exceeded 30°C). Depending on weather conditions, they flew at various altitudes. Bird–aircraft collisions were recorded frequently.

During the reproductive season, *Motacilla alba* (White wagtail; 20–23 g) and *Motacilla flava* (Yellow wagtail; 18–21 g) were observed near the runway in grassland habitats containing various herbaceous plants and fruit trees (mulberry, fig, cherry, oleaster, olive, quince). These species occurred in flocks and small groups, remaining active throughout the day, especially during morning and evening hours. Their maneuverability in flight is high (Mustafayev & Sadigova,

2011). Due to their low body mass, they are not considered hazardous to aircraft engines or other components. Maneuverability in flight is high, and flight altitude was recorded at 20–50 m.

Sturnus vulgaris (Common starling; 70–100 g) inhabits grasslands near the runway, areas with diverse herbaceous vegetation, fruit trees (mulberry, fig, cherry, oleaster, olive, quince), almond trees, pomegranate trees, and ornamental plants. Following the reproductive period, the number of individuals increases due to newly fledged juveniles. Large flocks (400–500 individuals or more) performing complex aerial maneuvers pose a significant threat to aircraft safety (Fig. 3). Flock flights are most frequently observed in the morning and evening. In flight, they exhibit diverse maneuvers at 50–150 m altitude, and flock-level collisions with aircraft are considered dangerous. *Pastor roseus* (Rosy starling; 59–90 g), which shares similar ecological characteristics with the Common Starling, was observed during the study period in small groups of no more than eight individuals in the morning hours. *Corvus cornix* (Hooded crow; 500–600 g) was recorded across all natural and synanthropic habitats of the airport area during the breeding season. Due to its relatively well-developed central nervous system compared to many other birds, this species exhibits strong abilities to detect and evade danger (Mustafayev & Sadigova, 2005). Flights of solitary birds, small groups, and flocks were recorded at altitudes of 10–100 m. Within Passeriformes, *Turdus merula* (Common blackbird; 75–150 g) was represented by few individuals, showing strong habitat fidelity and occurring singly. This reduces its probability of collision with aircraft, and even if a collision occurs, the impact force and associated hazard are low. It was recorded throughout the day in synanthropic areas containing trees, located away from the runway. *Passer domesticus* (House sparrow; 22–32 g) and *Passer montanus* (Eurasian tree sparrow; 19–25 g) were recorded in nearly all natural habitats of the airport area in small groups and flocks. Peak flight activity within the airport occurred at 10–50 m altitude, mainly in the morning (06:00–11:00) and evening hours (19:00–21:00).

Conclusion

During the reproductive season at Heydar Aliyev International Airport, 8 orders, 18 families, 23 genera, and 28 species of migratory-breeding and sedentary birds were recorded. Of these, 27 species were observed during daylight hours within the airport area, and 1 species (*Athene noctua*, the little owl) during nighttime. Across the daylight period, 27 species were active between 06:00–

11:00, 10 species between 11:00–18:00, and 22 species between 19:00–21:00. Based on peak activity times, the safest window for aircraft operations is considered to be between 11:00–19:00. According to density-based encounter scores, 20 species were evaluated at 0–20 points, 12 species at 20–40 points, 13 species at 40–60 points, 13 species at 60–80 points, and 7 species at 80–100 points. Among species scoring 0–20 points, 6 species pose collision risks; among those scoring 20–40 points, 7 species pose risks; and among those scoring 40–60 points, 6 species pose risks (Table 1). Among the 13 species rated at 60–80 points, 8 species (*Plegadis falcinellus*, *Larus ichthyaetus*, *Larus cachinnans*, *Larus canus*, *Columba livia*, *Sturnus vulgaris*, *Pastor roseus*, *Corvus cornix*) were deemed high-risk. All 7 species rated at 80–100 points (*Plegadis falcinellus*, *Larus ichthyaetus*, *Larus cachinnans*, *Larus canus*, *Columba livia*, *Sturnus vulgaris*, *Corvus cornix*) are classified as species posing real hazards to aircraft operations. Regulating aircraft movement schedules in accordance with the daily activity patterns and occurrence frequencies of birds can significantly reduce the likelihood of bird-aircraft collisions.

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