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COMPARATIVE ANALYSIS OF THE BIRD SPECIES DIVERSITY FOR BORYSPIL, ZHULIANY AND ODESA AIRPORTS' IMPACT AREA

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Анотація

Проведено порівняльний аналіз видового різноманіття птахів в зоні впливу аеропортів Бориспіль, Жуляни та Одеса. Розглянуті чинники формування орнітологічної ситуації обраних об'єктів.

Ключові слова: орнітофауна, видове різноманіття, видовий склад, аеропорт, авіація.

Abstract

Comparative analysis of the bird species diversity and composition for Boryspil, Zhuliany and Odesa airports impact area was carried out. The factors of the ornithological situation formation at chosen objects were considered.

Keywords: avifauna, species diversity, species composition, airport, aviation.

Introduction

Since the earliest days of aviation, it has suffered from the hazards coming from wildlife, particularly avifauna. [1] Most of bird strikes with aircraft happen at lower altitudes, often – in the vicinity of airports, or directly over their territories. [2, 3] To understand these interactions and prevent hazards for both natural world and human life and society, one must realize the tremendous variety of impacts and reactions, coming from different organisms. And for that, study of species compositions, inherent to the airports, is vital.

Amongst Ukrainian airports Boryspil, Zhuliany and Odessa airports are in the top 5 according to the number of registered aircraft collisions with avifauna. [4] Obviously, this parameter is influenced by many factors, e.g., the passenger traffic, size of airport, frequency of flight operations. Yet, natural factors, such as surrounding ecosystems, inherent natural conditions and populational characteristics should not go overlooked. Therefore, it is interesting to analyze these factors and their contribution to collision events.

Results

Boryspil airport (KBP) is the biggest international airport of Ukraine, with overall area of 927 ha and two runways of 4 and 3.5 km, which serves more than 50% of all international flights in the country. It is located at the distance of 18.5 km to the east of Kyiv city, near the city of Boryspil, and has two terminals for passengers and one for cargo flights. KBP is the only airport of Ukraine with transcontinental status, and its annual passenger flow is ~15 million passengers. Zhuliany airport (IEV) is an auxiliary airport which serves Kyiv and Kyiv agglomeration. It has an area of 265 ha, and one runway 2.3 km long, and is located directly in the capital, 8 km to the southern west of the city center. It has 3 passenger terminals, and the passenger traffic for of IEV is constantly growing with its peak in 2018-2019 at ~2.7 million people. Odessa airport (ODS) is the biggest international airport which services the south of Ukraine. ODS has close proximity to the Black Sea, and a distinctive feature of providing mixed services (both civil and military flights). Its area is 570 ha, and it has one runway 2.8 km long. Its passenger traffic is growing as well, and since 2016 exceeds 1 million passengers (1.7 million in 2019).

According to the Rules of ornithological support of flights of the state aviation of Ukraine [5] and Aviation rules of Ukraine "Technical requirements and administrative procedures for aerodrome certification" [6], all airports of Ukraine are obliged to keep annual recordings and draw Management plans for hazards posed by wildlife in the aerodrome areas. We were able to gain access to those data for our airports of interest, which is given in Table 1.

Table 1

Species diversity patterns of KBP, IEV and ODS airports of Ukraine

Airport	**KBP**	**IEV**	**ODS**
№ of species over the recent observation period (5 years) atp immediate airport area (500 m radius)	20 (10 singing/flocking, 5 predatory, 3 waterfowl, 1 stork and 1 hen)	21 (9 singing/flocking, 4 predatory, 4 waterfowl, 1 hen, 1 owls, 1 storks and 1 heron)	20+ (6+ singing/flocking, 8 predatory, 2+ waterfowl. 2 owls and 1stork and 1 hen
№ of species in the local community (up to 15 km) over longer time	69 (Over the entire observation period)	93 (Kyiv city)	243 (Regional pool)
Most numerous species	rooks (*Corvus frugilegus*); starlings (*Sturnus vulgaris*)	hooded crow (*Corvus cornix*)	rooks (*Corvus frugilegus*)
Other frequent species	buzzards (*Buteo buteo*); rough-legged buzzards (*Buteo lagopus*)	gulls (*Larus argentatus*); swifts (*Apus apus*); rooks (*Corvus frugilegus*); magpies (*Pica pica*); pigeons (*Columba livia*); sparrows (*Passer domesticus*); lapwings (*Vanellus vanellus*); starlings (*Sturnus vulgaris*);	starlings (*Sturnus vulgaris*); gulls (*Larus argentatus*); pigeons (*Columba livia*); jackdaws (*Corvus monedula*); magpies (*Pica pica*); gray partridges (*Perdix perdix*)
Seasonal or incidental species	partridges, gulls, ravens, kestrels, herons and storks	buzzards, herons, storks, mallards, swallows, falcons, owls, tits and partridges	buzzards, hawks, kestrels, falcons, waterfowl, as well as owls, storks and herons

Having analyzed species diversity, we have defined several patterns. First of all, the numbers of species directly at the territory of airports (i.e., primarily runway strips) is quite similar for all three objects, despite different locations and natural preconditions. Considering the data on species composition, which shows clear prevalence of certain species common for all three objects (such as, rooks, starlings, gulls etc.), we can make an assumption, that airports, similarly to urban areas, attract only certain species, which possess specific features and adaptations making their life near the airport successful. All these species are united by the fact that they are mostly either partial or temporary synanthropes, meaning that they do not live in artificial structures, but use urban and industrial zones for foraging, rest, migration stops and other purposes. Interestingly, full synanthropes, such as pigeons and sparrows, common for heavily urban areas, have considerably smaller presence at the airports, which moves this type of industrial objects closer to suburbs in terms of species composition and diversity patterns. Another important observation is that the most typical birds of the studied airports belong to *Corvidae* family, specifically to *Corvus* genus, which presently is considered to be amongst the most intelligent species on the planet, with high encephalizatopion quotient and intricate tool-making and using abilities, similar to those of non-human primates. This could imply that such objects as airports discriminate species presence by intelligence and adaptability factors.

The bigger scale species composition, which includes seasonal and incidental species, show that this similarity pattern continues even with seemingly rare or occasional sightings – all three airports are frequently visited by a rather big variety of predatory birds and big waterfowl (storks and herons). Latter is probably the product of all three objects' natural conditions, considering their placement near the big water bodies and smaller individual water objects, as well as the presence of technical ponds on the territory, and the agricultural fields and suburban settlements in the vicinity. The presence of birds of prey, however, also provide solid evidences of additional foraging opportunities. While agricultural fields present satisfactory hunting grounds on their own merit, there are studies that argue the additional potency, created by the noise, drawing small rodents and insects from their hideouts along the runway strips. [7]

Nevertheless, areas with larger scope of up to 15 km, understandably, contain higher diversity of species. It is quite difficult to derive any conclusions here, considering limitations and inaccuracy of the data of monitoring over larger areas and during prolonged time-periods due to economic and technical reasons. Here, airport ornithologists usually turn to the previously established data of regional pools. Still, looking at the available numbers, we can see that airports located within or near the big agglomerations (IEV and KBP) have lower diversity, than the one located in more natural conditions. There could be many reasons for that,

beginning with restrictions imposed on avifauna by urbanization, or the naturally higher diversity in southern regions of the country and proximity to the Black Sea, and ending with the political and operational factors, such as more precise management decisions, easier decision-making and cooperation with locals on avifaunal controls near the capital than it is near the coastline.

Conclusions

Comparative analysis of species diversity and qualitative species composition was carried out for three Ukrainian airports – Boryspil (KBP), Zhuliany (IEV) and Odesa (ODS). Similarities in numerical diversity for immediate airport areas and runways, as well as in species composition and their semi-synanthropic character were established. Assumptions regarding origins and causes of such situation were suggested, specifically, regarding discriminatory nature of industrial and urban zones in general and airports in particular, as well as possible geographical and ecological sources of distinct species pool segregation. Finally, limitations of data and consistent research of species diversity and composition of larger airport impact areas (up to 15 km) were outlined, as well as preliminary analysis of available data was presented.

Overall, we see that Ukrainian airports impose patterns on wildlife on their impact areas, which are yet to be thoroughly investigated and clearly established. Therefore, additional studies regarding causal relations between wildlife, airport structures and operation, as well as influence of aviation and its infrastructure on ecology and geography of communities, populations and separate species are supposed to be done.

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