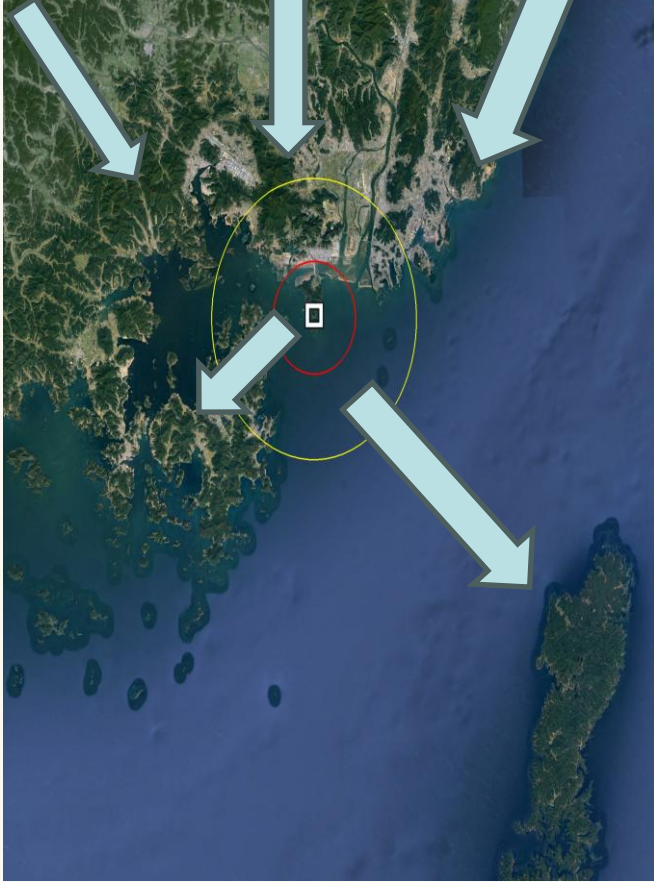




# The “established migration route” through Gadeok Do



Dr. Nial Moores, Director, Birds Korea. Busan, March 9 2025

From internet



ICAO (2002) Section 2.5.8 “Bird hazards at proposed new airports can be minimized by careful selection of the site to **avoid established bird migration routes** and areas naturally attractive to birds”

1. ICAO Guidance most relevant to Gadeok Do
2. Flaws of the Gadeok Do EIA (MLIT 2023)
3. Counting migratory birds to assess the Bird Strike Risk

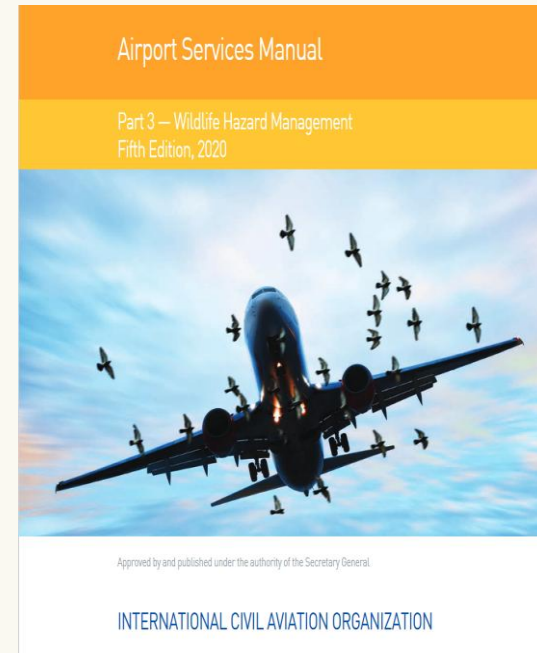




# 1.1. International Civilian Aviation Organisation (ICAO)

<https://www.icao.int/pages/default.aspx>

1. UN Agency working under the banner of “Safe Skies. Sustainable Future”
2. ICAO advises on safety standards on all aspects of aviation in ways that do not impinge on national sovereignty of Contracting Parties
3. ICAO 3-step process to reduce the bird strike risk:
  - (1) Try to avoid locating airports in unsuitable areas (initial planning)
  - (2) Conduct appropriate research to assess bird strike risk (EIA and as part of Wildlife Hazard Management Plan / Program)
  - (3) Respond appropriately (reducing attractants, scaring birds off etc.)



Cover: ICAO (2020)



Muan © Korea Times



## 1.2 ICAO: “Established Bird Migration Routes”

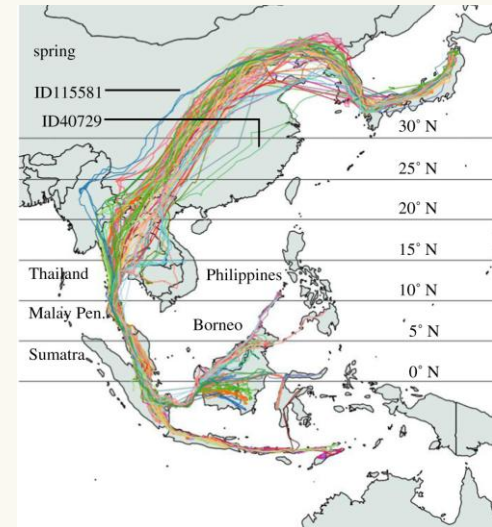
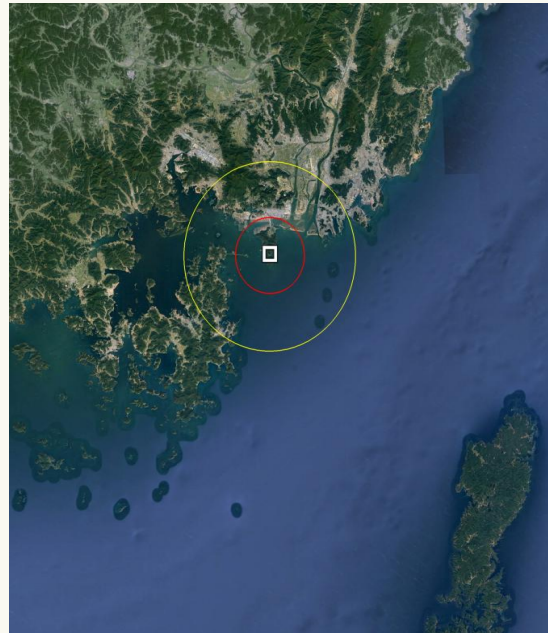
- ICAO (1987) Section 5.5.8 (“Hazards”) : “Sites adjacent to wildlife reserves, lakes, rivers and coastal areas...etc., may not be desirable because of the danger of aircraft collision with birds.”
- ICAO (2002) Section 2.5.8 **“careful selection of the site to avoid established bird migration routes** and areas naturally attractive to birds”

Geoje-Busan coast known for decades as being on a bird migration route



Fig. 01  
Migration Routes of White-Naped Cranes  
Heading Northward from  
Izumi City (Kagoshima prefecture)

Higuchi (2001)



Sugasawa & Higuchi (2019)



## 1.3. Clear Guidance: “No Bird Sanctuaries” within 8km

**ICAO** (2002)

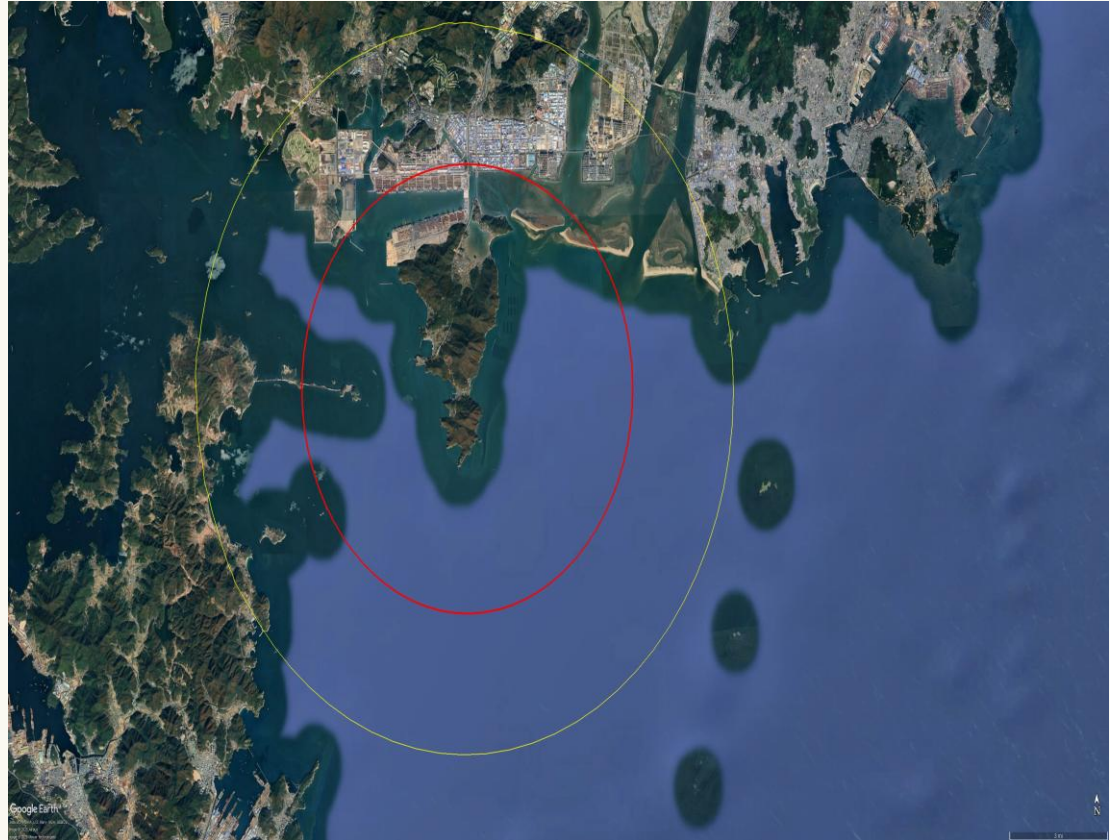
Appendix 2

No “Wildlife Sanctuaries” (“bird sanctuaries”, “game reserves”)

Within 8km

**국토교통부** 고시 제2017-601호, 제27조 공항주변의 부적합한 토지이용 방지

“공항 표점에서 8km 이내의 범위의 지역: 조류보호구역, 사냥금지구역, 음식물쓰레기 처리장



(ICAO 2020, 2-6): Wildlife Hazard Management Program needed out to 13km as 95% of documented bird strikes take place below 2,000 feet (=610m) above ground and “an aircraft on a normal approach would descend into this zone at approximately 13 km from the runway”.



# 1.4 Distance of Proposed Runway from Nakdong Estuary Protected Bird Habitat (# 179, 1966), Wetland Protected Area



국토교통부 고시 제 2017-601호, 제27조 공항주변의 부적합한 토지이용 방지

“공항 표점에서 8km 이내의 범위의 지역: 조류보호구역, 사냥금지구역, 음식물쓰레기 처리장



## 2.1 ICAO EIA / Wildlife Hazard Management Plan

ICAO (2002) Section 3.8.1: “An environmental impact assessment provides a systematic approach for identifying the environmental effects of proposed projects in order to allow for, where necessary, the modification of plans and incorporation of measures to minimize or eliminate any potential adverse effects on the environment.”

ICAO (2002), Section 3.8.3: “The environmental impact assessment report must be clear, concise and suitable for public scrutiny, if required”

ICAO (2020) Section 3.1.2: “The first step in a safety risk assessment of wildlife hazards is to define the area that will be assessed. This should include the entire aerodrome (= airport) and its vicinity, in particular aircraft approach and take-off”

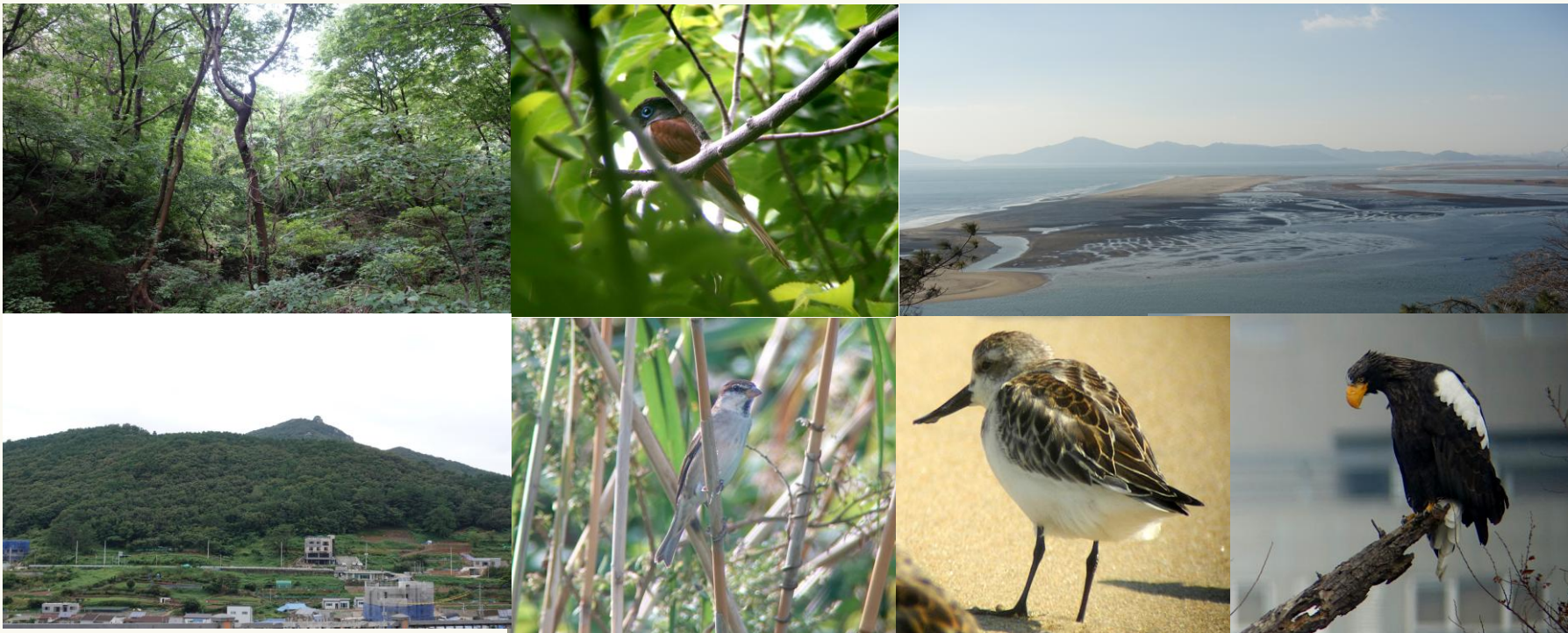
ICAO (2020) Section 2.2.4.6: “Wildlife surveys should cover the entire year to account for seasonal changes and should also consider different phases of the day. The survey should also consider aircraft movements, runways in use and wildlife behaviour”

ICAO (2020) Section 2.2.4.3, calls for research on “the type of wildlife activity and movements (for example: direction and altitude)”



## 2.3 MLIT (2023) Bird Research

- 62 dates of research between November 2022-July 2023 (not a full year)
- Count data organized into four bands up to 13km from Daehang (massive and diverse area)
- Very little research within actual proposed runway area
- Most of the research appears to have been in the Nakdong Estuary

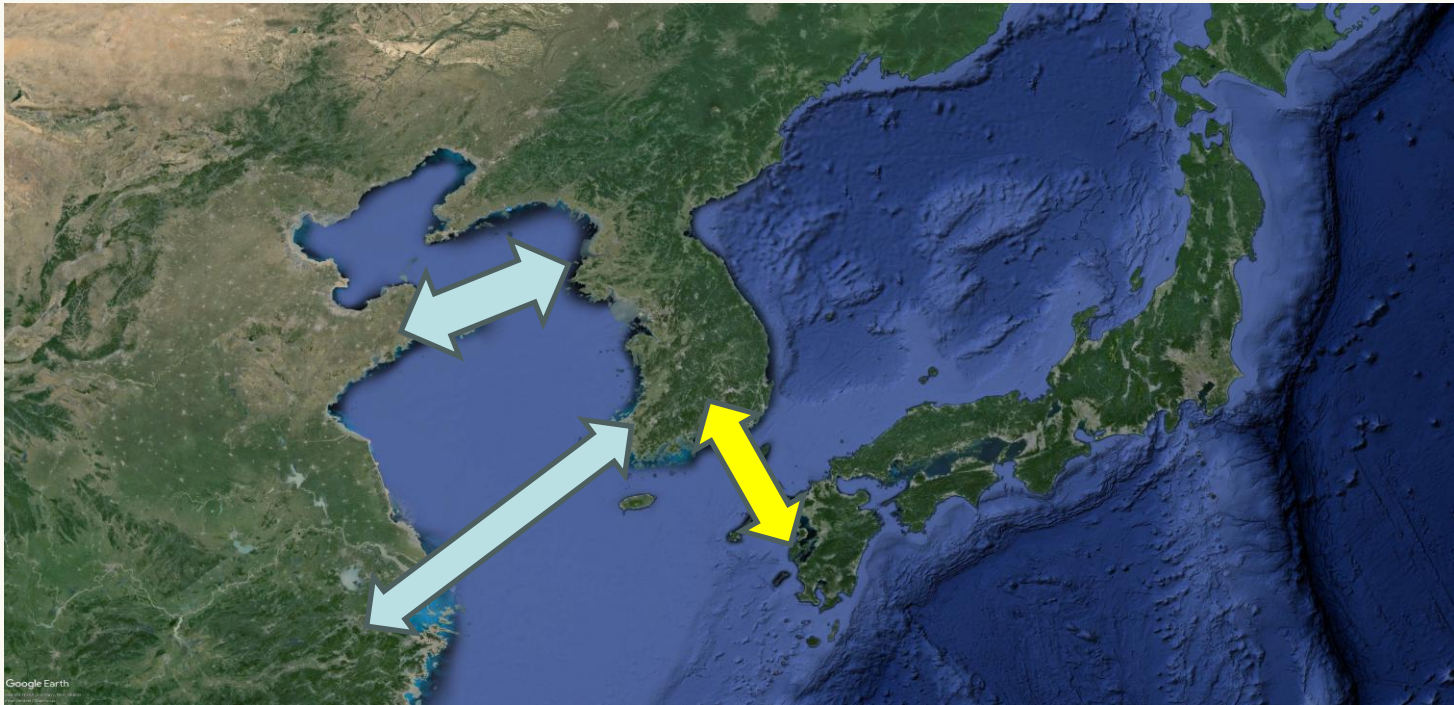






## 2.3 MLIT (2023) Bird Research

- Recognises area as being on a migration corridor
- However, only includes 15 dates of fixed point counts (5 dates at 3 different count points) aimed at measuring active migration - all in May, focused only on raptors
- Identified Yeondaebong as an important area for migratory raptors



Why many migratory birds? Because most landbirds prefer short sea-crossings



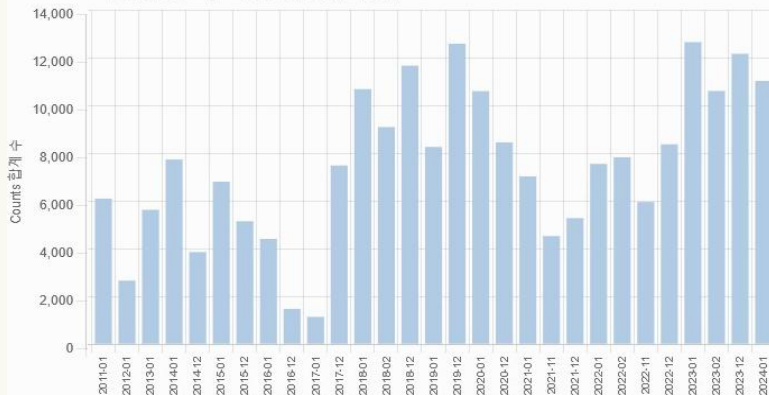
## 2.4 EIA (MLIT 2023): some major flaws

1. EIA research was not through the “entire year” (only 10 months)
2. EIA does not contain ANY direct counts of migrating birds over the proposed runway area
3. EIA does not attempt to estimate the height and direction of the vast majority of landbirds (an important part of “wildlife behaviour”)
4. EIA risk matrix for bird strike is constructed largely on (irrelevant) satellite tracking of birds tagged away from the proposed airport
5. The EIA should try to link airport impacts to national and regional biodiversity conservation needs. However, it omits mention of the Ramsar defined international importance of adjacent wetlands

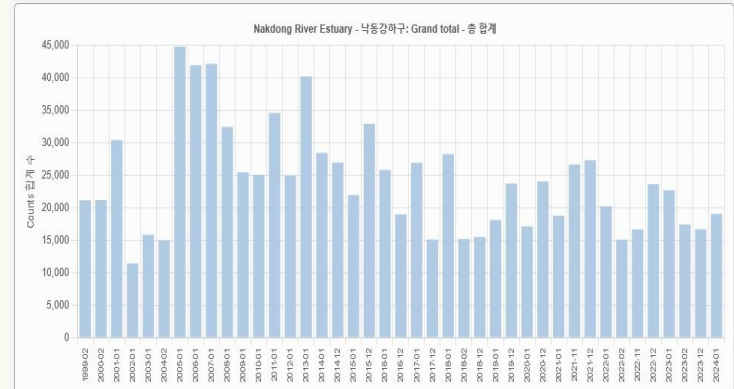
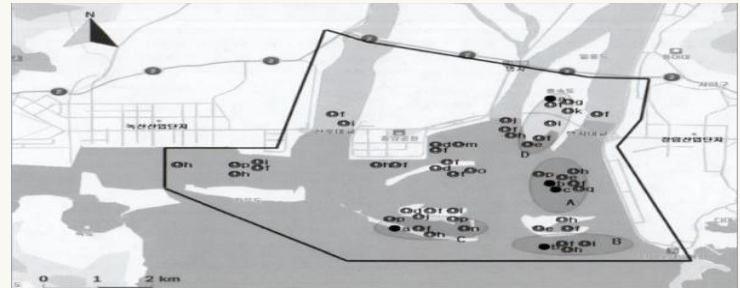


## 2.5 EIA major flaws: Adjacent Wetlands include a “Bird Sanctuary” less than 4km from the runway...

Ministry of Environment Winter Census Data (1999-2024)



**Gejeo Coast: 4 waterbird species in 1% or more of a population (MOEK 2011-2024)**



**Nakdong Estuary: 9 waterbird species in 1% or more of a population (1999-2024)**

Figures from database built by Andreas Kim <https://www.andreas-kim.de/MoE/MoE.html>



## 2.6 EIA Major Flaws: Omission of related infrastructure



Source: BBS News (June 2022)

습지보호지역(습지보전법)

▷ 면적 : 37.72km<sup>2</sup>(최초시정일 1999.8/환경부)



※ 2011년 보호지역 확대 : 대미동, 참차도, 불속도 하단부 포함 (시남동갈 최속 겸세지역까지 확대)

Planned outer coast road will cut through part of Wetland Conservation Area



## 3.1 Understanding Bird Migration

- 1, Seasonal movement: >90% of bird species recorded in Korea migrate. All have different migration timing
2. Although every species is different, all species' migration strategies are shaped by climate and by geography at a range of scales (from large to small)
3. Most landbirds try to avoid long sea crossings (and therefore select shortest sea crossings). Geoje/ Gadeok Do / Dadapo is adjacent to the shortest sea crossing to Japan
4. Many small landbirds migrate at night, while many larger bird species use soaring flight during the day to cross larger stretches of unsuitable habitat, including sea
5. To gain sufficient height, soaring birds need to use thermals (air rising, often from dark surfaces) or updrafts caused by wind hitting hill ridges
6. Many soaring birds therefore follow hill ridges, and concentrate in areas before taking sea crossings, waiting for the best weather



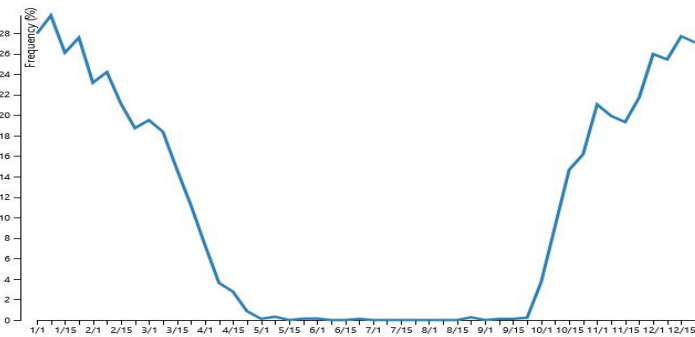
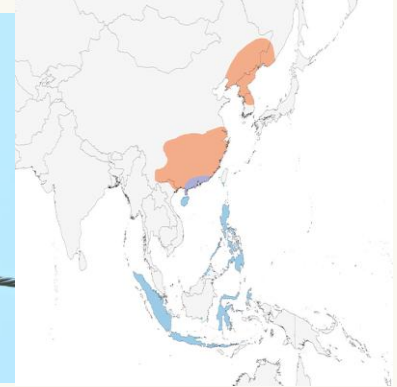


## 3.2 Differences in Migration Timing

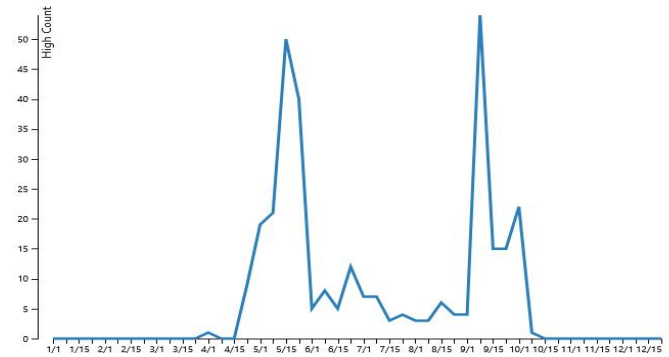
말뚝가리



붉은배새매



■ Eastern Buzzard

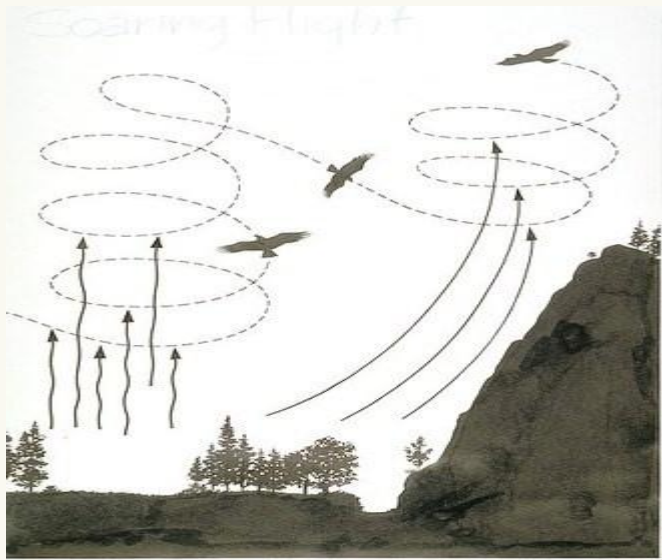


■ Chinese Sparrowhawk

Range Maps by Birds of the World; Monthly records in ROK from eBird



## 3.3 Soaring Birds: Thermals and Updrafts



Source: National Park Service, USA

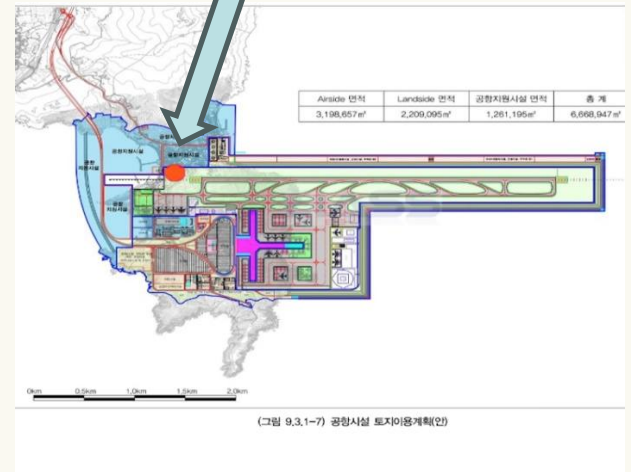


Soaring raptors, Yeondaebong, Gadeok Do



## 4. 1 Our Survey Results

1. To assess (visible) bird migration through the proposed airport area, we conducted fixed point counts of migrating birds for 64 hours and 30 minutes on 11 dates in Daehang, Gadeok Do, between September 2021 and February 2024.
2. We recorded 10,933 individuals of a total of 68 species flying over the proposed runway area at a mean rate of 2-3 individuals per minute. Among species of highest conservation value and also of highest risk to aircraft were more than 3,110 individual raptors of 13 species.







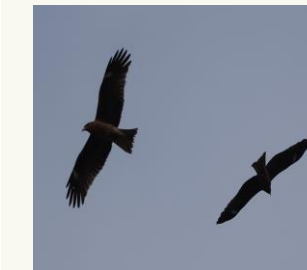
## 4.2 Survey Results

Date	Year	Number of Birds By Date	Estimated height 30-175m above mean sea level	Estimated height 175m-700m above mean sea level	Estimated height >700m above mean sea level
September 12	2021	126	62	64	0
September 18	2021	2,480	92	2,078	310
September 24	2021	456	201	234	21
October 3	2021	612	436	169	7
October 13	2021	1,079	486	584	9
November 4	2021	121	78	42	1
March 25	2022	898	91	787	20
October 15	2023	1,049	867	173	9
November 7	2023	584	432	150	2
November 16	2023	1,478	1,196	261	21
February 17	2024	1,152	1,145	7	0
<b>Grand Total</b>		<b>10,035</b>	<b>5,086</b>	<b>4,549</b>	<b>400</b>



## 4.3 Survey Results: Raptors Only

	Highest day count	Estimated total number individuals
물수리	4	11
벌매	3	5
초원수리	1	1
붉은배새매	2,358	2,445
조롱이	4	9
새매	80	285
참매	9	22
솔개	9	16
왕새매	130	209
말뚝가리	34	75
황조롱이	3	9
비둘기조롱이	1	1
새호리기	3	9
매	4	10
<b>Total</b>	<b>Grand</b>	<b>3,107</b>



Why is this important?



## 4.4 Bird Strike Risk

ICAO (2020) Section 3.2.3: “where good quality strike data is not available, it is important to consider collision determined by the existence of wildlife and their movements on and in the vicinity of the aerodrome.”

ICAO (2020) Section 3.3.2, “Generally, heavier wildlife and greater flock size increases the probability of damaging an aircraft and impacting its flight performance. Flocking behaviour could include multiple impacts or increase the probability of a strike.”

말뚝가리



Mass: 610 g–1,012 g  
Flock size: 6

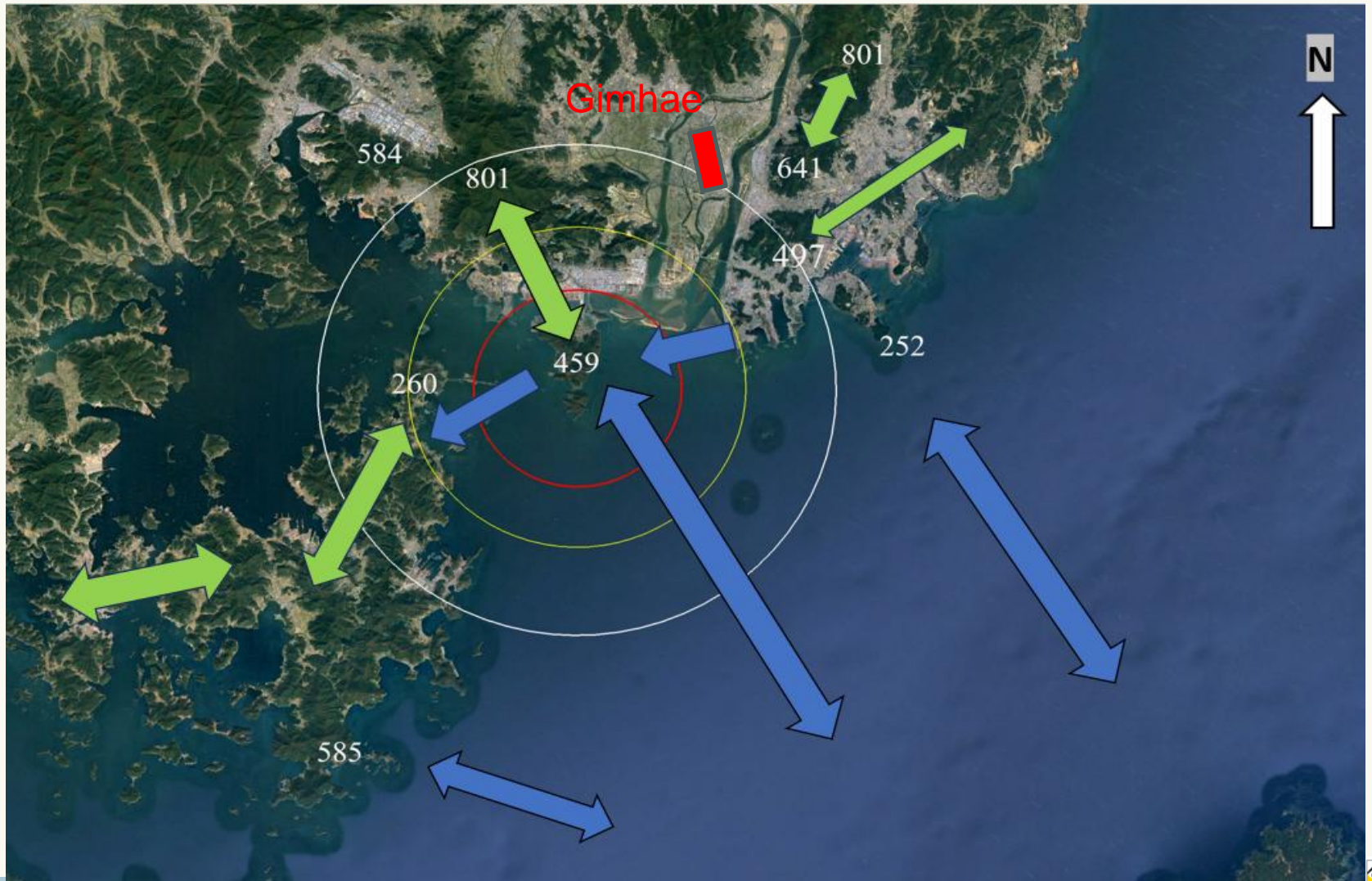
붉은배새매



Mass: 140-210 g  
Flock size: 1,100



## 4.5 Routes taken by Soaring Birds





## 4.6 “Funelling” of smaller Landbirds





## 4.6 Short-cut taken by seabirds





## 4.7 Gimhae Airport

Winter Census (2015-2024):

- Between 20,000-40,000 Waterbirds each winter within 8km – so a high bird strike risk from waterbirds
- However, most waterbirds stay low over water
- Soaring birds largely pass to the east and west, away from aircraft flight paths





## 4.8 Survey Conclusions

1. Large numbers of birds migrate through Gadeok Do during the day (an unknown number will also migrate through at night)
2. Based on their direction of flight, the majority appear to be on migration from and to Japan; others seem to be migrating along the south coast
3. We counted large numbers of migrating raptors using Yeondaebong and Kuksu Bong to help them gain height before and after sea crossings
4. The majority of birds we observed were at heights where there is a high risk of collision with aircraft
5. The highest bird strike risk species found by our surveys is 붉은배새매
6. Additional surveys suggest 민물가마우지 and 재갈매기 also pose a risk

Much more information can be found in our report