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Overstayed Migratory Bird Species on The Coast of Banda Aceh City, Aceh Province

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Abstrak: Migrasi burung adalah fenomena ekologis yang kritis dipengaruhi oleh berbagai faktor seperti perubahan suhu, ketersediaan makanan, dan siklus reproduksi. Memahami dinamika populasi burung migran dalam wilayah tertentu penting untuk upaya konservasi. Studi ini bertujuan untuk mengidentifikasi spesies burung migran di Kota Banda Aceh, dengan fokus pada fenomena burung migran yang tinggal lebih lama dari biasanya. Dilaksanakan antara April dan Juni 2022, pengumpulan data dilakukan di beberapa lokasi dengan metode perhitungan konsentrasi. Analisis data deskriptif digunakan untuk mencatat spesies burung, dan indeks Shannon-Wiener digunakan untuk menilai keanekaragaman hayati. Hasil penelitian mengungkapkan keberadaan empat spesies burung pantai. Studi ini menekankan pentingnya melindungi populasi burung migran di lingkungan perkotaan dan menyoroti potensi dampak dari kehilangan atau gangguan terhadap mereka. Upaya konservasi bersama penting untuk melindungi spesies ini, dan kondisi yang menguntungkan dapat mendorong beberapa individu dari spesies yang biasanya bermigrasi untuk tetap tinggal di wilayah perkotaan.
Kata kunci: Banda Aceh; konservasi lingkungan; migrasi burung; studi lapangan.

Abstract: Bird migration is a critical ecological phenomenon influenced by various factors such as temperature changes, food availability, and reproductive cycles. Understanding the dynamics of migratory bird populations within specific regions is essential for conservation efforts. This study aims to identify migratory bird species within Banda Aceh City, focusing on the phenomenon of overstaying migratory birds. Conducted between April and June 2022, data collection took place in several locations, employing the concentration count method. Descriptive data analysis was performed to catalog bird species, and the Shannon-Wiener index was utilized to assess biodiversity. Results revealed the presence of four shorebird species. The study underscores the importance of protecting migratory bird populations in urban environments and highlights the potential impacts of their loss or

disruption. Joint conservation efforts are crucial to safeguarding these species, and favourable conditions may encourage some individuals from commonly migrating species to remain in urban areas.
Keyword: Banda Aceh; bird migration; environmental conservation; field study.

1. Introduction

Migratory birds are a type of bird that periodically moves between different areas during certain seasons [1]. Bird migration occurs due to various factors, including changes in temperature, food availability, and reproductive cycles. There are two main types of migration performed by birds viz spring migration and autumn migration. During migration journeys, some birds may stop at various stopping points to rest and search for food [2].

Some migratory birds possess physical and behavioral qualities favorable to long journeys, such as strong flight abilities and the ability to find migration routes using visual cues such as cloud formations and the orientation of the sun. However, it is important to remember that climate change and habitat destruction can negatively impact bird migration. Drastic changes in temperature and food availability, as well as disruption to their natural habitat, can disrupt migration patterns and even threaten the survival of some migratory bird species [3].

The migration patterns of birds in Indonesia can be disrupted by various factors that collectively pose a serious threat to the populations of migratory birds. One of the major challenges is the loss of natural habitats due to deforestation, land conversion, and habitat destruction. When their natural habitats are damaged, migratory birds struggle to find places to nest, feed, or rest during their migration journey. Additionally, illegal hunting and trapping of wild birds for the pet trade also constitute a significant threat, endangering the survival of migratory species [4]. Other factors include environmental pollution by toxic chemicals, climate change affecting the availability of food resources, human disturbances such as bright lights confusing migratory bird

navigation, and the loss of oases that are crucial stopover points during migration. To protect migratory birds in Indonesia, conservation efforts, law enforcement against illegal hunting and trapping, and public education about the importance of migratory bird conservation are necessary [5].

One of the significant migration routes in Indonesia is Sumatra and Kalimantan islands. The islands of Sumatra and Kalimantan play a role in bird migration routes, especially for birds moving between mainland Asia and areas such as Australia and Papua [6]. One of the stopover areas for migratory birds to carry out reproductive activities, feeding is in Banda Aceh City, Aceh Province. So far, much data has been collected on the presence of migratory birds in Banda Aceh, but research publications focusing on overstaying migratory bird species in Banda Aceh City are still difficult to obtain, therefore it is important to conduct this research.

2. Research Method

2.1 Place and Time of Research

The research was conducted in April and June 2022. The observation points consist of 3 locations in the city of Banda Aceh. The environmental conditions in the research locations are mangrove ecosystems and wetlands, which are important habitats for various marine life. [7]. Location and observation points for bird migration in Banda Aceh City (Figure 1.)

2.2 Research Methods

Monocular telescopes Pristar 10-30x50 HD, a Nikon Coolpix P900, SVBONY binocular telescope 10x42, tally sheets, stationery, Tripod F36050M 360/50mm, hand-counters Joyko HC-4D, and field guides are among the equipment and supplies used in research to observe water birds. [8]–[10]. Four of bird observations were made between 7:00 and 17:00 WIB. The method used is field observation, in which observers monitor and document birds in their natural habitats. Observers need to approach the birds calmly to avoid

disturbing them. The use of field guides or bird identification apps aids in the identification process.

Additionally, observations include recording data such as time, date, weather, and the number of individuals observed. During observation, it's essential to prioritize environmental protection and the well-being of the birds. The results of these observations are then analyzed to understand migration patterns, the presence of specific species, and contribute to a deeper understanding of bird life and conservation [11]. The Shannon-Wiener (H') diversity index, to determine the species diversity of waterbirds [12].

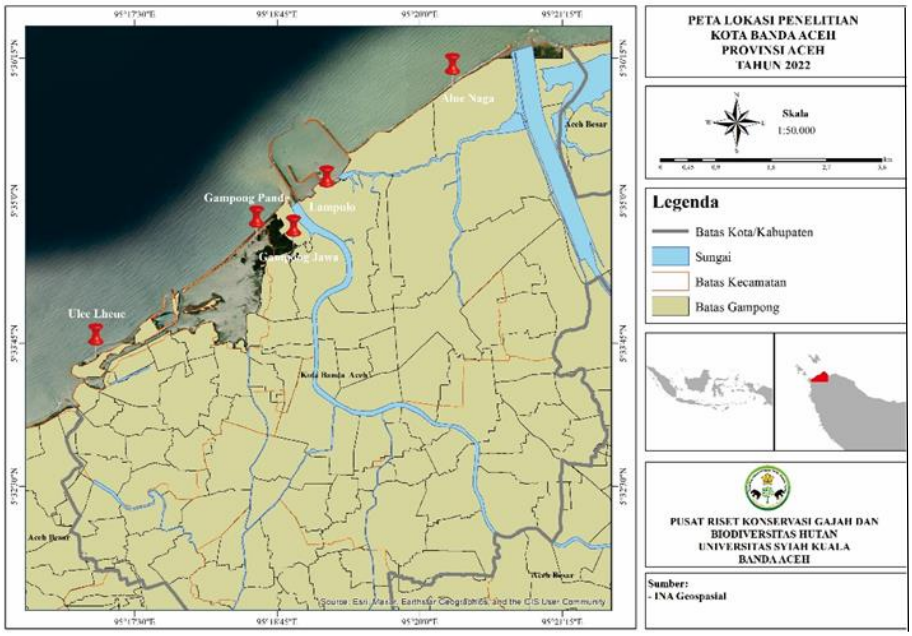

Figure 1. Research Location Map [7]

Documented bird species are then categorized by family and status as migratory or settlers. Additionally, birds are picked based on their agreement with CITES, the IUCN Red List, and *Peraturan Menteri LHK No. P.106/MENLHK/SETJEN/KUM.1/12/2018* about their preservation status. The research data will also formulate policy recommendations for the protection of migratory birds in the city of Banda Aceh. Recommendation data will be collected through interview sessions and questionnaires with the residents of Banda Aceh, and will be analyzed descriptively.

3. Results and Discussion

3.1. Types of Migratory Birds Overstaying on the Coastal City of Banda Aceh

According to the observations, there were 2 families and 4 species of migrating birds. The Charadriidae family is the one that frequents areas around beaches and wetlands the most. Because the Charadridae and Scolopacidae families are the two largest families in the shorebird group, the Scolopacidae group contains more species. [7], [11], [13], [14]. Given that the two families prefer natural settings at the coast or in open wetlands, typically near the ocean, the coastline (beach front) and wetlands at the review site are also suitable areas for the two families. [7], [8].

The main reason for the existence of bird species that undergo migration is the high competition for food, the difficulty in finding food, limited food stocks, high nesting site threats, all of which lead to delays in preparation for migration. This refers to the primary reasons for bird migration, where birds migrate primarily in response to changes in seasons and weather conditions. When winter arrives, some bird species migrate to avoid the cold temperatures that can threaten their survival. During migration, they move to warmer areas where food sources are more abundant, such as insects, seeds, and plants. Furthermore, migration also helps birds avoid competition with other species for food resources. Some birds also migrate for reproductive purposes, moving to areas that are more suitable for nesting and raising their offspring. During the journey, they can conserve energy and avoid wastage in search of food. Although the navigation mechanisms used by birds during migration are not fully understood, many bird species can rediscover the places they migrated to in previous years, often with remarkable precision. Thus, bird migration is a fascinating natural phenomenon that has been the subject of in-depth scientific research for many years[15].

Table 1 Overstaying Migratory Bird Species on the Coast of Banda Aceh City

Species Name			Famili	Conservation Status		
Local Name	Common Name	Scientific Name		PP/ PM	IUCN	CITES
Gajahan Erasia	Eurasian Curlew	*Numenius arquata*	Scolopacidae	DL	NT-d	-
Trinil Pantai	Common sandpiper	*Actitis hypoleucos*		-	LC-d	-
Kedidi Kecil	Little Stint	*Calidris minuta*		-	LC-i	-
Cerek Pasir Mongolia	Lesser Sandplover	*Charadrius mongolus*	Charadriidae	-	LC-u	-

Note:
1. PP = Peraturan Pemerintah Nomor 7 Tahun 1999, a government regulation. (DL: *Dilindungi*, Protected)
2. PM stands for Peraturan Menteri LHK No. P.106/MENLHK/SETJEN/KUM.1/12/2018, which was issued by the Minister of Environment and Forestry.
3. Threatened status as of 2022, according IUCN 2022:
   – NA = Not yet evaluated for the IUCN Red List; EN = Endangered; VU = Vulnerable; NT = Near Threatened;
   LC = Least Concern
   – Population trend: d = declining, i = rising, s = steady, and u = unknown
4. CITES trade categories (2022):
   – Appendix I = all species that are imperiled by commerce and listed as endangered; trade is only authorized under specific circumstances, such as for scientific study.
   – Appendix II: Species that, while not currently threatened, are at risk of extinction due to overexploitation.

Based on the data in Table 1, it can be seen that out of the 4 species found during the study, there is 1 species, namely *Numenius arquata*, which is classified as "Near Threatened" according to the IUCN. If a bird species is categorized as "Near Threatened," it means that the species has been identified as being at risk and requires further attention to protect it and ensure its survival. This classification indicates that a bird species has a high risk of facing threats to its survival but has not yet reached the "Vulnerable" or "Endangered" level. Efforts are important to prevent the species from falling into more serious categories like "Vulnerable," "Endangered," or "Critically Endangered."

Table 2 Index of Migratory Overstay Bird Diversity

Species Name	Activity	TH	∑	Pi	Ĥ
Numenius arquata	looking for food	TPt-Se; Sw-Ta	5	0,017	0,07
Actitis hypoleucos	looking for food	TPt-Se; Sw-Ta	7	0,024	0,09
Calidris minuta	looking for food	TPt-Se; Sw-Ta; HM	41	0,141	0,276
Charadrius mongolus	looking for food	TPt-Se; Sw-Ta; HM	123	0,423	0,364

Note:
Finding location (TH) = Nipa palm and mangrove forest (HM); rice fields and ponds (Sw-Ta); swamp and pond (Ra-Te); open ground, grasslands, and shrubs (LT-PR-SB); beaches and straits (TPt-Se).
(Indonesia: *Lokasi Temuan (TH) = Hutan Mangrove and Nipah; Sawah and Tambak; Rawa and Telaga; Lahan Terbuka, Padang Rumput, dan Semak Belukar (LT-PR-SB), and Tepi Pantai dan Selat (TPt-Se)*)

Based on Table 2, the data presented indicates that the locations where birds are most commonly found are on the beach, rice fields, and fishponds. The beach is often chosen as an ideal habitat for many migratory birds for the following reasons. First, the beach provides easy access to abundant food sources, including plankton, fish, and marine invertebrates, which are crucial for migratory birds to obtain energy during their journey. Second, the beach provides a safe place for birds to perch and rest for a while. Third, the beach is a geographical feature that is easily followed by migratory birds, helping them maintain their migration routes. Furthermore, the beach often has access to fresh water and a diverse range of environments that support the needs of various migratory bird species. Finally, some migratory birds use the beach as a stopover point before continuing their journey to more distant islands. However, it is important to preserve coastal habitats and shorelines, as they are also vulnerable to threats that can disrupt migratory bird populations.

The diversity index indicates a low value due to the limited number of bird species found during the observation. However, this does not necessarily imply that the habitat is damaged or under high threat. This is because the research focuses on birds that overstay during migration seasons, and naturally, only a few bird species will be encountered. Typically, when the number of bird species encountered is low, the bird diversity index tends to be low. This indicates a negative correlation between these two factors, which means that when one factor increases, the other tends to decrease, and vice versa.

The existence of migratory birds has a very important role in the environment and ecosystem. Bird migration refers to the seasonal movement of birds from one area to another in search of food sources, breeding grounds or to escape extreme weather conditions. Migratory birds often move from one area to another within a considerable distance. During their journey, they consume fruits and seeds, which are then excreted in their feces in a new

location. This helps spread grains and plants from one area to another, aiding in the spread of vegetation and genetic diversity [16].

Several types of migratory birds are insectivorous. When they arrive in an area with an overpopulation of insects, they can help control natural pests effectively, helping to maintain the balance of the ecosystem and reducing agricultural losses. Migratory birds also serve as a food source for other predators, such as birds of prey and predatory mammals. This is an example of a food web in an ecosystem. Nutrient-filled bird droppings can help fertilize the soil in areas visited by migratory birds. These nutrients help maintain the balance of nutrients in the soil and promote plant growth [17].

The arrival of migratory birds can be a sign of the changing seasons. For example, birds come from cold climates to warmer areas in winter, and vice versa. This can help humans and other creatures to prepare for the changing seasons. Migratory birds can also be of interest to bird watchers and nature lovers. Many people enjoy watching migratory birds on their way, and this can inspire awareness about the importance of preserving the natural environment [18].

Migratory birds are an integral part of the global ecosystem web. Their movements help maintain the balance of populations and interactions between species, which in turn has an impact on the balance of the ecosystem as a whole. The study of bird migration has provided a deeper understanding of navigation, orientation, breeding behavior and adaptation to environmental changes [19]. This information contributes to our general knowledge and understanding of nature. It is important to remember that the role of these migratory birds is closely linked to the diversity and sustainability of the natural environment. Loss of migratory bird species or disruption to their migratory movements can have a detrimental impact on the ecosystem as a whole.

3.2 Threats of Overstayed Migratory Birds in Urban Areas

The existence of migratory birds in urban areas can present several threats that need attention. Cities often have building structures and surfaces that are different from the natural habitat of migratory birds. Increased development and urbanization can lead to loss of natural habitats, whether they be grassy areas, urban forests or water areas. This can disrupt migration patterns and cause difficulties for birds in finding food and shelter. Air and water pollution that is common in cities can have a negative impact on the health of migratory birds. Pollutants such as vehicle exhaust, dust particles and hazardous chemicals can damage the respiratory systems of birds and interfere with the quality of water they need [20], [21].

Artificial light from street lighting, buildings and vehicles can disrupt the natural rhythms of migratory birds. Excessive light at night can affect their orientation based on the stars or the moon, causing birds to become confused and lost [22]. Tall buildings, bridges and other urban infrastructure can be obstacles for migratory birds. Occasionally, birds can crash into buildings while trying to fly over urban areas, causing injury or death [23][24]. Cities may not have as abundant natural food sources as migratory birds' native habitat. This can result in starvation and malnutrition in migratory birds if they cannot find sufficient food [25].

Human activities in cities such as noise, construction and traffic can disturb migratory birds. This disturbance can interfere with the birds resting, communicating, and finding food [26]. Densely populated urban environments can allow disease to spread more easily, both among migratory birds and between birds and humans. Addressing these threats requires collaboration between governments, communities and environmental organizations to develop environmentally friendly policies and practices for migratory birds [27]. This could involve creating urban parks focused on sustainability, pollution reduction, maintenance of natural habitats, and educational

campaigns to raise awareness about the importance of migratory bird conservation in cities [28].

3.3 Policy Recommendations for the Protection of Migratory Birds in the City of Banda Aceh

Protection of migratory birds in urban areas is important to ensure the survival of bird species that make seasonal movements. Several policy recommendations that can be implemented to protect migratory birds in urban areas. First, support the development of parks, city parks, urban forests, and grassy areas in urban areas. Green open spaces provide a place to rest and eat for migratory birds. Strive for routine maintenance to maintain the sustainability of this environment.

Second, Identify the main migration routes of birds and set limits on the height of buildings along these routes. Tall buildings can interfere with bird navigation and result in collisions with building glass. Third, limiting excessive night light in cities by implementing more energy-efficient lighting regulations and avoiding too bright light in important areas for migratory birds. Bright light at night can disrupt the bird's sleep patterns and orientation. Fourth, identify important resting places for migratory birds, such as parks, lakes, rivers, and swamp zones. Ensure appropriate habitat management to support the needs of these birds.

Fifth, conducting public education campaigns about the importance of migratory birds and how the community can contribute to protecting them. This can involve activities such as workshops, seminars, and school activities. Sixth, support policies and efforts to reduce air and water pollution in urban areas. Pollution can negatively impact migratory bird habitat quality and their health. Seventh, conducting monitoring and research on migratory birds in urban areas to understand their movement patterns, behavior and challenges they face. This data will help develop more effective policies.

Eighth, collaboration with environmental organizations and local communities concerned with the protection of migratory birds can strengthen protection efforts and awareness campaigns. Ninth, if carnivorous animals are disrupting migratory bird populations, consider sustainable and ethical control measures, such as sterilization or relocation, if necessary. Tenth, establish prohibited areas or safe zones around important places for migratory birds, such as places to stop, rest and breed.

Eleventh, limiting the use of toxic pesticides in urban areas close to migratory bird habitats. Pesticides can damage the food chain and impact birds and the environment. Twelfth, if there is an artificial feeding and rearing program for migratory birds, ensure that the food provided is according to their needs and does not interfere with their natural diet. Implementation of these policies requires collaboration between government, communities, environmental organizations, and other relevant parties. With a concerted effort, urban migratory birds can receive the protection they need for their survival.

4. Conclusion

Based on the results of the study, there were 4 species of shorebird group data. Loss of migratory bird species or disruption to their migratory movements can have a detrimental impact on the ecosystem as a whole. With a concerted effort, urban migratory birds can receive the protection they need for their survival. The conclusion of migration bird research can also have an impact on conservation efforts. Data on bird migration can assist in designing conservation and habitat management programs that support migratory bird populations. This research can provide a better understanding of how environmental changes, such as climate change or habitat destruction, affect bird migration. In this context, the conclusion can focus on the impact of environmental changes on migratory bird populations.

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