JPPIPA 11(2) (2025)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

The Presence of Migratory Shorebirds on the Coast of Aceh Besar Beach and Banda Aceh

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Received: September 21, 2024
Revised: December 16, 2024
Accepted: February 25, 2025
Published: February 28, 2025

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DOI: 10.29303/jppipa.v11i2.10060

Abstract: The coast of Aceh Besar and Banda Aceh is one of the areas that is a stopover site for migratory shorebirds. This study aims to identify the types of migratory shorebirds and habitat types that support the presence of migratory shorebirds on the coast of Aceh Besar and Banda Aceh. The research was conducted in February to April 2024. The method used in this study is *Purposive sampling* with *Point count*. Data collection of migratory shorebirds species is carried out using *point count*. The study results show that 1.244 individuals migratory shorebird visit on the coast of Aceh Besar, that is *Numenius phaeopus, Numenius arquata, Pluvialis fulva, Charadrius mongolus, Charadrius leschenaultii, Gallinago megala, Calidris minuta, Actitis hypoleucos, Xenus cinereus,* and *Limosa lapponica.* Type of habitat used by migratory shorebird are mangroves, ponds, beaches, muddy plains, and grassy fields. On the coast of Banda Aceh 433 individuals migratory shorebird with habitat types of mangroves, ponds, muddy plains and beaches, that is *Numenius arquata, Pluvialis fulva, Charadrius mongolus, Charadrius leschenaultii, Actitis hypoleucos*. The diversity of migratory shorebirds on the coasts of Aceh Besar and Banda Aceh is in the medium category. It is necessary to establish protection areas for migratory shorebird and educate the public about the importance of preserving the enviroment.

Keywords: Aceh; Coastal; Migrant; Shorebird

Introduction

This Shorebirds are a group of birds that are ecologically dependent on aquatic areas, specifically the coast (Jumilawaty et al., 2011). Most of the shorebirds in Indonesia are migratory shorebirds (Haryoko, 2014). Migratory shorebirds are a group of waders that migrate from breeding sites to non-breeding from the Northern Hemisphere to the Southern Hemisphere at a certain time (Howes et al., 2003).

Migratory shorebirds use coastal areas as sites to forage and carry out various other activities. Coastal areas have an important role for migratory shorebirds as an intermediary in their migration behaviour (Siregar, 2018).

The coast of Aceh has significant potential for the presence of birds, especially for migratory birds. (Gagarin et al., 2024). The coast of Aceh has a diverse ecosystem and is rich in natural resources. Coastal areas such as mangrove ecosystems, beaches, and ponds are important Sites for most bird species, including migratory shorebirds because they provide important resources for food and Sites to rest (Khairunisak et al., 2022).

The coast of Aceh Besar and Banda Aceh City is one of the coastal areas that has biodiversity that is so varied and is an important indicator for the sustainability of coastal birds, both seabirds (*resident*) and types of migratory birds (migrant) (Gagarin et al., 2022).

The coastal area of Aceh Besar has a well-preserved mangrove ecosystem. According to DKP Aceh 2011, the

How to Cite:
Khairunisak, Fithri, A., Firdus, & Tarmizi, H. (2025). The Presence of Migratory Shorebirds on the Coast of Aceh Besar Beach and Banda Aceh. *Jurnal Penelitian Pendidikan IPA*, *11*(2), 871–879. https://doi.org/10.29303/jppipa.v11i2.10060

coastal area of Aceh Besar has a mangrove ecosystem covering an area of 133.94 ha. Muddy flats, especially mangrove ecosystems, are one of the ecosystems chosen by migratory coastal birds to rest and forage before returning to their breeding grounds. Mangrove areas provide an abundant food source for migratory shorebirds (Firdaus & Aunurohim, 2015).

In Aceh Besar and Banda Aceh City, bird trade often occurs, so this is also one of the factors that causes a scarcity of birds (Raihan et al., 2025). The continuous trade has a great influence on bird populations, including migratory shorebirds. Migratory shorebirds choose certain areas that have potential for their survival, which have abundant food sources and comfortable resting sites. One of the coasts chosen by migratory shore birds as a stopover place is the coast of Aceh Besar and Banda City. Research on the diversity of migratory shorebird species on the coast of Aceh Besar and Banda Aceh is important to protect the habitat of migratory shorebirds and maintain the preservation of the coastal areas of Aceh Besar and Banda Aceh.

Studies on migratory shorebirds on the coast of Aceh Besar and Banda Aceh have not been carried out. This study aims to identify the species of migratory shorebirds and the type of habitat chosen by migratory shorebirds as stopovers on the coast of Aceh Besar and Banda Aceh.

Method

Research Time and Location

The research was conducted in February-April 2024. The selection of the research location was performed by *purposive sampling* in areas that are stopovers for migratory shorebirds. The site is chosen based on the type of habitat preferred by migratory shore birds based on various literature. In each research location, namely the coast of Aceh Besar and the coast of Banda Aceh, observations were made on 4 types of habitat, namely in mangrove areas, mud plains, ponds, and beaches which are habitats preferred by migratory shore birds because they provide abundant food sources and resting site that are.

Data Collection

Data collection on migratory coastal bird species is using the *point count* method, by recording, documenting, and identifying each species of migratory shorebird found at each observation location, the individual number of each species of migratory shorebird is counted.

The count of the number of individual migratory shorebirds using the point count method in each coastal observation location of Aceh Besar and Banda Aceh was carried out in 4 habitat types. Data collection on each habitat type in each observation site was carried out at 3 observation points with a distance of 300 meters between points. Data collection on migratory shorebird species and the number of individuals of each species of migratory shorebird was carried out for 20 minutes at each observation point.

Data Analysis

Data on the species of migratory shorebirds that visit the coastal areas of Aceh Besar and Banda Aceh City are analyzed descriptively and then presented in the form of tables and pictures. The distribution of the location of the presence of migratory shore birds is presented in the form of a maps.

The index of the diversity of migratory shorebird diet types is counted using the Shannon-Weiner diversity index formula (Krebs, 1989) as follows:

$$H' = -\sum_{i=1}^{s}(Pi)(\mathrm{In}Pi) \quad (1)$$

Which,

$$\mathrm{Pi} = \sum \frac{\mathrm{ni}}{\mathrm{N}} \quad (2)$$

Remarks:
H′ = General diversity index Shannon Wienner
In = logarithm natural
Pi = Number of Individuals of a species
ni = Number of individuals of the species to-i
N = Total Number of individuals
Preposition criteria:
If ≥ 3 = High category
If 1 < H` ≤ 3 = Medium category
If H` ≤ 1 = Low Category

Result and Discussion

Migratory shorebirds visit the coast of Aceh Besar at three observation stations, namely Lambadeuk, Peukan Bada District, Cadek, Baitussalam District, and Gampong Baro, Mesjid Raya District. The presence of migratory shorebirds on the coast of Banda Aceh is found at four observation stations, namely Gampong Pande Kuta Raja District, Lampulo Kuta Alam District, Lambaro Skep Kuta Alam District, and Alue Naga Syiah Kuala District.

The presence of migratory shorebirds is influenced by environmental and ecological conditions that are important for the conservation of migratory shorebirds (Canham et al., 2021). The main factors that greatly affect it are habitat hetheregonity, prey availability, and environmental conditions that interact to provide a comfortable place for migratory shorebirds to stop by (Cai et al., 2023). The migratory shorebird is very fond of

mudflats, swamps, and plantations that provide it with a suitable food source (Putra et al., 2017).

Migratory shorebirds on the coast of Aceh Besar stop at several areas with habitat types of mud plains, mangroves, beaches, ponds, and grassy fields. Kamal et al. (2017) states that bird habitat types in Aceh Besar are coastel forest areas, fields, gardens, and paddy fields. According to Lismarita et al. (2022), The coastal area provides various types of mangroves which are a source of nutrients and organic matter that are a source of food for aquatic biota and organisms in the area.

The presence of migratory shorebirds in this area is also influenced by the availability of feed sources in the form of Crustacea. Ngginak et al. (2013) stated that Crustacea contains 106 calories in the form of 3% carbohydrates, 15% fat, and 82% protein. Crustaceans per 100 grams have the highest selenium content with 38 mcg (54%), cholesterol 152 mg (51%), and protein 20.3 g (41%).

The type of habitat greatly affects the presence of birds in an area (Ogunsusi & Adeleke, 2017). The coast of Banda Aceh also provides a good habitat for migratory shorebirds. The types of habitats preferred by migratory shorebirds on the coast of Banda Aceh are mud flats, mangroves, beaches, and ponds. Ponds on the coast of Banda Aceh are ponds owned by residents which are shrimp and fish farming ponds. Migratory shorebirds stop by the area at certain times to forage. According to Pratiwi et al. (2023), the pond area provides high dissolved oxygen and low carbon dioxide (CO_2).

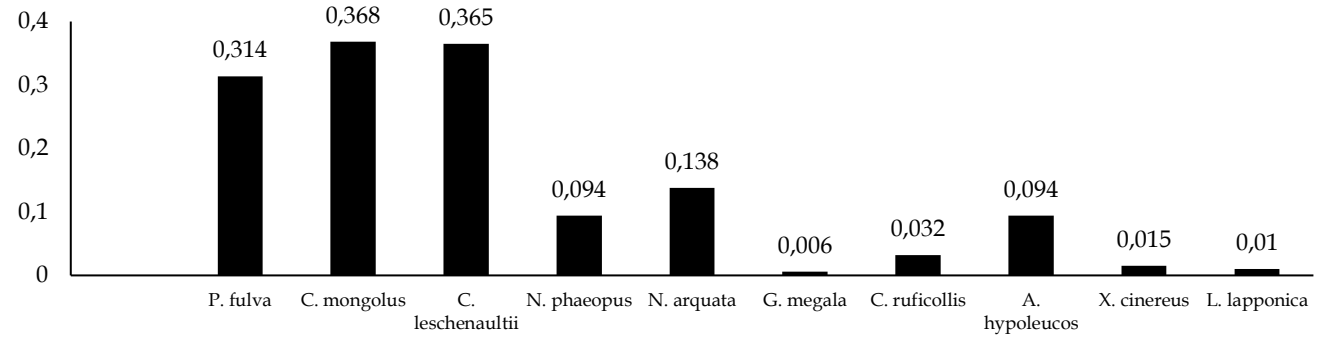

Figure 1. Index of migratory beach bird diversity on the coast of Aceh Besar

Migratory shorebird species that stop by the coast of Banda Aceh are less closely related to migratory shorebird species on the coast of Aceh Besar, this is related to the type of habitat used by migratory shorebirds in this area less than on the coast of Aceh Besar. This is also following the index value of the diversity index of migratory coastal bird species in each region (Figure 1. and Figure 2).

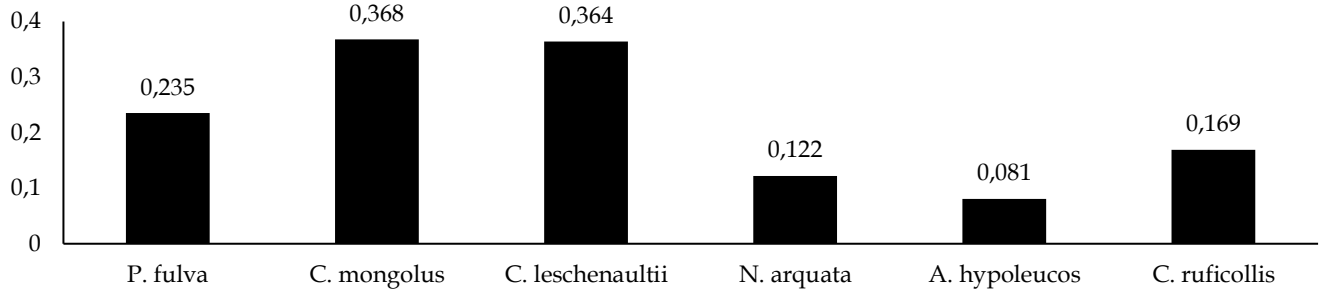

Figure 2. Index of migratory shorebirds on the coast of Banda Aceh

The level of diversity of migratory shorebirds on the coast of Aceh Besar and the coast of Banda Aceh shows the value of the diversity index in the medium category. Where the value of the index of species diversity of migratory coastal birds on the coast of Aceh Besar is 1.436 and the value of the index of the diversity of migratory shorebirds on the coast of Banda Aceh is 1.339.

The level of diversity of a species is greatly influenced by environmental factors such as climate change, geographical location, genetic variability in a species and habitat destruction (Mo et al., 2022). The high diversity of species is influenced by factors such as varied climate, complex geography, topographic diversity, genetic variability within species, and minimal habitat damage caused by humans (Ge, 2017). Good habitat conditions are very supportive of the presence of various types of birds (Masykur et al., 2023).

The result showed that most of the Banda Aceh coastal area had been converted into housing,

settlements and other private interest. Dibba et al. (2025) stated that this land conversion occurred due to urbanization and population growth. Prasad (2020) states that land use change in coastal areas has an adverse impact and causes erosion.

Based on the research conducted, the results were obtained as many as 10 species of migratory shorebirds visiting the coast of Aceh Besar and 5 species of migratory shorebirds stopping at the coast of Banda Aceh. The species of migratory shorebirds that stop by the coast of Aceh Besar and Banda Aceh City are *Numenius phaeopus, Numenius arquata, Pluvialis fulva, Charadrius mongolus, Charadrius leschenaultii, Gallinago megala, Calidris minuta, Actitis hypoleucos, Xenus cinereus,* and *Limosa lapponica.*

Distribution map of migratory shorebird in the coast of Aceh Besar and Banda Aceh is on the Figure 3. Migratory shorebird species that stop off the coast of Aceh Besar and Banda Aceh are shown in Table 1.

Table 1. Species of Migratory Shorebirds on the Coast of Aceh Besar and Banda Aceh

Location	Family	Species		Individual	IUCN
		Local name	Latin name		
Aceh besar coast	Charadriidae	Pacific golden plover	Pluvialis fulva	233	LC
		Siberian sand plover	Charadrius mongolus	475	EN
		Greater sand plover	Charadrius leschenaultii	403	LC
	Scolopacidae	Eurasian whimbrel	Numenius phaeopus	32	LC
		Eurasian Curlew	Numenius arquata	55	NT
		Swinhoe's snap	Gallinago megala	1	LC
		Red Necked stint	Calidris ruficollis	8	LC
		Common Sandpiper	Actitis hypoleucos	32	LC
		Terek sandpiper	Xenus cinereus	3	LC
		Bar-tailed godwit	Limosa lapponica	2	NT
Banda aceh coast	Charadridae	Pacific golden plover	Pluvialis fulva	45	LC
		Siberian sand plover	Charadrius mongolus	154	EN
		Greater sand plover	Charadrius leschenaultii	183	LC
	Scolopacidae	Eurasian Curlew	Numenius arquata	16	NT
		Common Sandpiper	Actitis hypoleucos	9	LC
		Red Necked stint	Calidris ruficollis	26	LC

Siberian sand plover *(Charadrius mongolus)* is a species of migratory shorebird that lives in coastal areas, mudflats, and sandy beaches (Viana et al., 2023). Based on the IUCN Red List *C. Mongolus* (Figure 4.) is a species of migratory shorebird with the conservation status of *Least Concern* (LC). On the coast of Aceh Besar and the coast of Banda Aceh, this bird is found foraging in coastal areas and wetlands with mangrove vegetation at low tide. When moving from the perch to the foraging area, this bird flies and is present in large groups. This bird will separate itself from its group and forage solitarily when it wants to approach its prey, this bird's behaviors of foraging is to run close to its prey, then stop for a moment and then peck at its prey quickly. According to Domínguez et al. (2016) *C. mongolus* forages by *the* "*run-stop-peck*" method, this is done to save energy and the chances of success in getting prey are greater.

Eurasian Curlew *(Numenius arquata)* is one of the species of migratory shorebirds that visit at both observation locations, namely the coast of Aceh Besar and the coast of Banda Aceh. This bird is one of the types of migratory shorebirds in conservation status *Near Threatened* (NT) IUCN Red List 2017. The results showed that this bird roosted in small groups and often ate separately from its group. This is done by this bird to avoid competition. Eurasian Curlew (Figure 4.) is found on the coast of Aceh Besar and Banda Aceh in mangrove habitat types and muddy plains are foraging at low tide, and carry out activities to clean themselves at high tide by taking shelter in mangrove rootse.

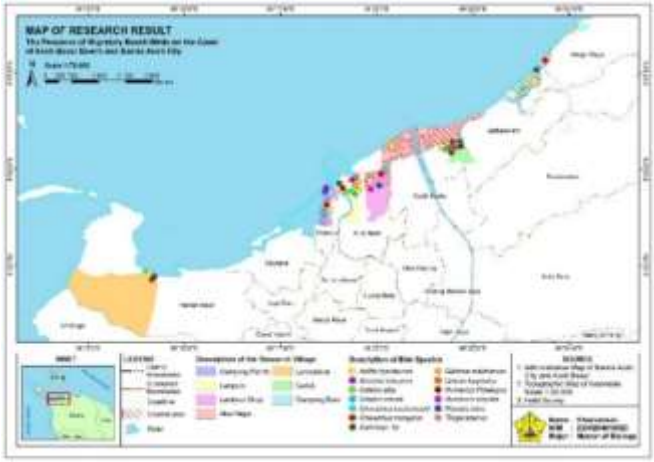

Figure 3. Distribution map of migratory shorebird on the coast of Aceh Besar and Banda Aceh

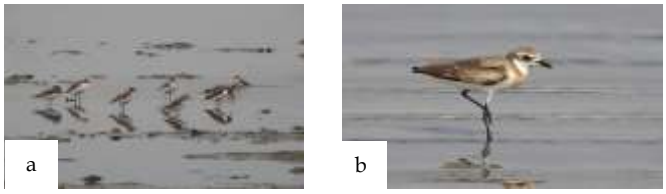

Figure 4. Siberian sand plover (*Charadrius mongolus*) Source: a). Research result, b). Avibase

According to Massey et al. (2016) *N. arquata* showed adjustments when foraging based on the potential of food species in the foraging site. Zwarts & Esselink (1989) states that *N. arquata* is one of the migratory coastal birds that eat worms, molluscs, and crustaceans. This bird lives in muddy, tidal estuaries and is usually alongside coastal areas.

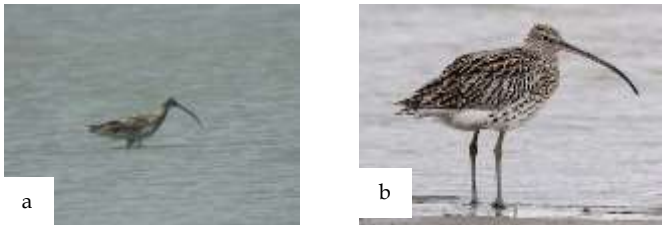

Figure 5. Eurasian curlew (*Numenius arquata*) Source: a). Research result, b). eBird, 2017

Eurasian whimbler (*Numenius phaeopus*) is a species of migratory beach bird found on the coast of Aceh Besar and Banda Aceh in the form of habitat types in the form of mud flats and mangrove areas. *N. phaeopus* (Figure 6.) chooses a muddy coastal area with mangrove vegetation as a place to forage and rest. Like other migratory coastal birds, this bird forages at low tide, making it easy to find prey. This bird carries out foraging activities in groups by walking around the area where there are *uca* burrows and checking each burrow with its beak, then catching *the uca* that is its target. According to Kuang et al. (2019) *N. phaeopus* is a type of migratory coastal bird that likes wetland areas that are small and have vegetation cover. Lee et al. (2014) states that *N. phaeopus uses* peck-foraging *techniques and* probes *that adjust to the availability of food sources in its area.*

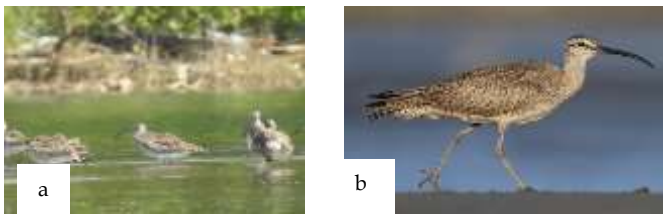

Figure 6. Eurasia whimbler (*Numenius phaeopus*) Source: a). Research result, b). eBird, 2020

Bar-tailed godwit (*Limosa lapponica*) is a type of migratory beach bird found on the coast of Aceh Besar with as many as 2 individuals. This bird was found foraging at low tide in the mudflats. *L. Lapponica* (Figure 7) has a long, straight beak that is a form of its adaptation when foraging, to probe mud and extract prey from substrates. According to Overduijn et al. (2020) Announce that during the migration season usually this bird is found in coastal areas, estuaries and mudflats. Ashari et al. (2017) states that *L. pudica* are types of invertebrate eaters such as worms, Mollusca, and crustaceans. Based on the red list IUCN, *L. lapponica* is a species of migratory shorebird that is included in the *Near Threatened* (NT) conservation status.

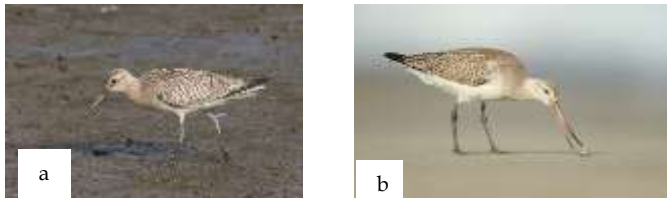

Figure 7. Bar-tailed godwit (*Limosa lapponica*) Source: a). Research result, b). eBird, 2019

Pacific golden plover (*Pluvialis fulva*) is a species of migratory coastal bird found on the coast of Aceh Besar and on the coast of Banda Aceh on mudflats, ponds, beaches, and grassy fields. The results of the study showed that most of the individuals of the Pacific Golden Plover found on the coast of Aceh Besar had changed their breeding plumage before returning to the breeding location, namely the Southern Hemisphere. This can be seen as a change in color which was initially golden brown to jet black at the bottom and back with a blackish brown pattern. According to Huang et al. (2022) *P. Fulva* (Figure 8.) it chooses foraging habitats in the form of open areas with short shrubs and rocky substrates. Entering the breeding period, this bird will change its plumage to breed feathers, with a darker color than usual. Round et al. (2012) states that *P. fulva* often utilizes various wetland areas such as mudflats and coastal areas that provide important resources for breeding and resting.

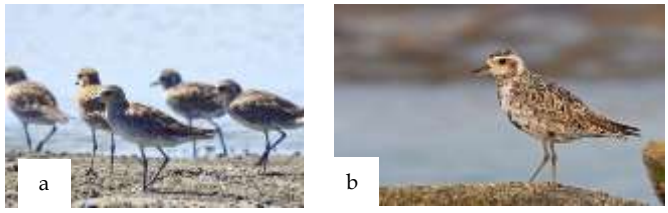

Figure 8. Pacific golden plover (*Pluvialis fulva*) Source: a). Research result, b). eBird, 2020

Greater sand plover (*Charadrius leschenaultii*) is a species of migratory shorebird found on the coast of Aceh Besar and the coast of Banda Aceh in large groups. The presence of this bird on the coast of Aceh Besar is found sunbathing on the beach at high tide, foraging on

muddy plains at low tide, and in wetland areas overgrown with mangrove vegetation when resting by using mangrove roots to perch. *C. leschenaultia* (Figure 9.) is also found on the coast of Banda Aceh City in a wetland area with mangrove vegetation. The results of the study showed that the eating behaviors of this bird was by settling and then running close to its prey when its prey was seen. Tomotani et al. (2020) states that the diet of this bird is in the form of invertebrates, especially small crustaceans found in sandy and muddy areas when the tide is low along the coastline.

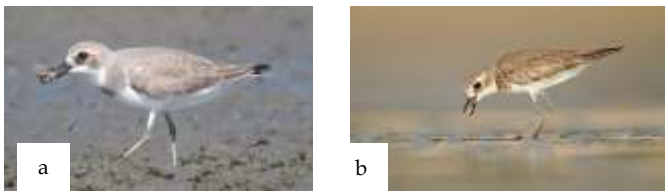

Figure 9. Greater sand plover (*Charadrius leschenaultii*)
Source: a). Research result, b). eBird, 2019

Swinhoe's snipe (*Galinago megala*) is a species of migratory shorebird found on the coast of Aceh Besar. This bird is found solitary only two individuals in the muddy plains area and close to mangrove vegetation (Tomotani et al., 2020). *G. megala* (Figure 10.) is very difficult to find in various regions due to its ability to camouflage and is very sensitive to human presence. The swamp bark has a fat body, short legs, pointed and straight beak. This bird is usually also called a large snipe bird that feeds in wetland areas in the form of invertebrates, especially Crustaceans.

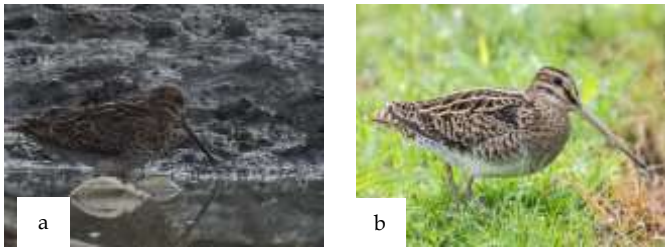

Figure 10. Swinhoe's snipe (*Galinago megala)*
Source: a). Research result, b). eBird, 2020

The common sandpiper (*Actitis hypoleucos*) is a type of migratory shorebird found on the coast of Aceh Besar in mangrove areas, mud flats and ponds. This bird is found solitary in some of these areas. The presence of Common sandpipers on the coast of Banda Aceh is found in mangrove areas, ponds, and grassy fields. Common sandpipers use the mangrove area as a resting place at high tide. This bird uses mangrove roots as a place to perch. *A. hypoleucos* (Figure 11.) take advantage of muddy plains and mangrove areas at low tide to forage. In addition, the pond area also provides a food source for Common sandpipers such as Crustaceans. Common sandpipers' eating behaviour is often in a solitary state by pecking at the substrate while walking and occasionally moving their backs such as dancing. Seipalla (2020) Common sandpipers prefer areas that have less dense vegetation, especially in areas that are not too sandy.

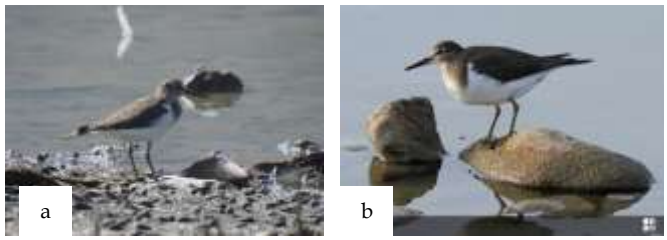

Figure 11. Common sandpiper (*Actitis hypoleucos)*
Source: a). Research result, b). BirdLife International, 2016

Red-necked stint (*Calidris ruficollis*) is a species of migratory shorebird found on the coast of Aceh Besar among a group of eight individual Red-necked stints. This bird is also found on the coast of Banda Aceh City as many as 26 individuals. According to According to Hammer et al. (2013) *C. ruficollis* (Figure 12.) has a small body, a small pointed beak a dark color and rapid movements. This bird has a distinctive black crown and a white collar that can facilitate the cumulation of the environment.

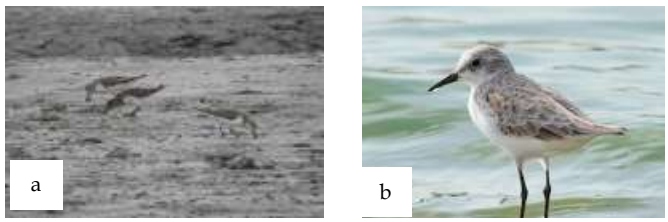

Figure 12. Red-necked stint (*Calidris ruficollis*)
Source: a). Research result, b). eBird, 2016

Terek sandpiper (*Xenus cinereus*) is a type of migratory beach bird found on the coast of Aceh Besar with a habitat type in the form of muddy plains among a group of 3 whimbler birds. *X. cinereus* (Figure 13.) uses the muddy plains at low tide to forage for macrozoobentos. The terek sandpiper is a type of migratory beach bird that is generally found in estuaries surrounded by mangrove forests. It appears in small numbers in the mudflats and is among other larger flocks of migratory shorebirds. Terek sandpiper is often found in grasslands, coastal areas and areas with little vegetation.

Birds that stop by the coast of Aceh Besar and the coast of Banda Aceh are very fond of mangrove areas. The birds use the mangrove area as a place to forage when the tidal is low, and it makes it easier for them to immediately perch on the mangrove branches when the

tide is high. Rahayu et al. (2017) stated that Crustacea is an invertebrate animal better known as crustaceans. According to Brusca (2013) Crustacea is an invertebrate that has a segmented body and consists of a fused head and chest (cephalothorax). Crustaceans are often utilized as a food source for animals that live in aquatic areas.

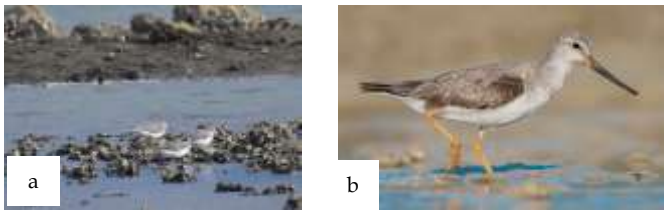

Figure 13. Terek sandpiper (*Xenus cinereus*)
Source: a). Research result, b). eBird, 2022

Mangroves in this area not only have benefits for migratory coastal birds but also have economic value for the community to build ponds. Budiarti et al. (2023) stated that mangrove areas provide a place for marine life such as fish, shrimp, and animals that use them as a food source. Mangrove areas also provide opportunities for communities to carry out fisheries cultivation.

Conclusion

The coatal areas of Aceh Besar and Banda Aceh are potential stopover sites for migratory shorebirds each migration season. Ten species of migratory shorebirds that visit the coast of Aceh Besar and the coast of Banda Aceh, including *Numenius phaeopus, Numenius arquata, Pluvialis fulva, Charadrius mongolus, Charadrius leschenaultii, Gallinago megala, Calidris ruficollis, Actitis hypoleucos, Xenus cinereus, dan Limosa lapponica*. The presence of migratory waders on the coast of Aceh Besar and Banda Aceh utilizes mangrove areas, mud flats, ponds, beaches and grassy fields as places to forage and rest. The diversity of migratory shorebirds on the coasts of Aceh Besar and Banda Aceh is in the medium category.

Acknowledgments
I sincerely appreciate it to all the friends who have participated in helping the author collect data and putting forward ideas and motivations directly or indirectly, so that the author can complete this article well.

Author Contributions
The research review team consisted of Mr. Muhammad Nasir, Mr. Dalil Sutekad, and Mrs. Zuriana.

Funding
This research received no external funding.

Conflicts of Interest
There are no conflicts of interest among any of the authors.

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