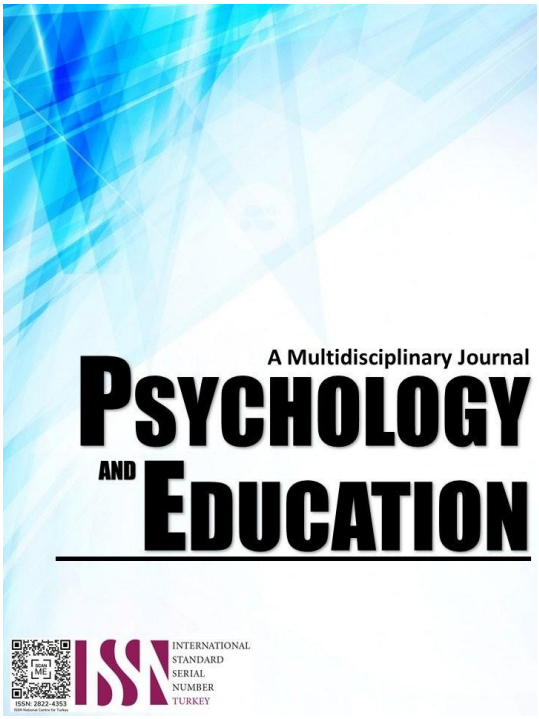
FLUCTUATING AVIAN POPULATIONS IN LALAGUNA MARSHLAND: INVESTIGATING THE ROLE OF COMMUNITY AWARENESS IN CONSERVATION EFFORTS



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Research Article

Fluctuating Avian Populations in Lalaguna Marshland: Investigating the Role of Community Awareness in Conservation Efforts

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Abstract

Lalaguna Marshland serves as a crucial breeding and habitat for various avian species. This study explores the observed changes in avian populations in the marshland and investigates the participation and awareness of the local community in its conservation efforts. It aligns with the Republic Act No. 1947, also known as the Wildlife Resources Conservation and Protection Act, which mandates the involvement of individuals in the Philippines in protecting and preserving wildlife and their habitats. It also identifies community-perceived contributing factors to avian population fluctuations and analyzes their impact on local livelihoods, with a focus on communities that are directly reliant on the marshland's resources. This study employed a qualitative research design, specifically narrative inquiry, to investigate the observed changes in avian species populations over the past few years, as reported by local communities in the marshland. Likewise, it aims to determine the local community's perception of the contributing factors that have resulted in the fluctuation of the avian population in Lalaguna Marshland and how these fluctuations affect local livelihoods, particularly those dependent on the marshland. The findings suggest that seasonal changes and temporal availability have a significant impact on the avian population, with birds adapting to shifts in climate, habitat, and food availability. Factors contributing to these fluctuations include food abundance and seasonal migration, emphasizing the interdependence between birds and their environment. The study also demonstrated how changes in avian populations impact livelihood, presenting both challenges, such as bird-farmer conflicts, and benefits, including the aesthetic and therapeutic value of birdwatching. Additionally, locals suggested that environmental education, with the help of signage and awareness campaigns, is one of the most significant conservation strategies for mitigating the decline of avian populations. These findings highlight the importance of sustainable conservation efforts in maintaining ecological balance while supporting local livelihoods around the marshland. The research concludes with a compendium of conservation policies and strategies for stabilizing avian populations, securing ecological balance, and maintaining community livelihoods. These findings provide valuable insights for policymakers, environmental organizations, and future researchers to inform their revisitation of community-based conservation and biodiversity management.

Keywords: *community awareness, fluctuating avian populations, Lalaguna Marshland, policy brief on stabilizing avian species population*

Introduction

Avian populations that thrive in marshlands are essential to our ecosystems, contributing significantly to the complex web of biodiversity and ecological balance. The vast range of bird species that inhabit marshlands enhances their aesthetic value and fulfills important environmental tasks such as seed dissemination, insect control, and nutrient cycling. Their presence denotes a healthy marshland environment, demonstrating the interconnectivity of species in this distinct ecosystem. Understanding the dynamics of bird groups in marshes entails investigating factors that influence their richness, distribution patterns, and interactions with other species, offering light on the complex ecological linkages at work (Kittelberger, 2023).

According to Ethier et al. (2017), avian population fluctuation describes how the number of birds within a particular population varies over time. These variations can be either increases or declines, and a complex interaction of factors, such as human activity, disease, predation, food supply, and environmental conditions, frequently causes them. Maintaining the stability and health of bird populations, as well as the success of conservation initiatives, depends on understanding these variations.

Additionally, Saether et al. (2016) perceive that for efficient conservation and management, it is crucial to comprehend changes in bird populations. Researchers can create focused strategies to preserve and restore bird populations by determining the elements influencing population trends.

On the other hand, Eithier et al. (2017) emphasize that avian population fluctuations directly impact livelihoods through their function in food webs. Many marshland birds, including ibises, egrets, and herons, are crucial fish and water predators. Bird population fluctuations may impact these prey species' distribution and abundance, influencing the prosperity of the regional fishing and aquaculture sectors. Furthermore, birds like flycatchers and insectivorous warblers that regulate insect populations frequently find a home in marshes.

In the Philippine context of avian population fluctuations, many of the endemic species of birds found in the Philippines are unique to the planet. However, massive deforestation and habitat degradation pose a danger to this biodiversity. In Palawan, the Philippines, population densities of understory birds were investigated in a 2011 study published in Oryx. According to the survey, old-growth

forests had the most significant density estimates for eleven species, including three of four vulnerable and five endemic species. To preserve Philippine birds, old-growth forests must be preserved (Mallari et al.,2021).

This study is in accordance with the Republic Act No. 1947, also known as the Wildlife Resources Conservation and Protection Act, which mandates the protection and preservation of wildlife and their respective habitats. This law emphasizes the importance of each individual's involvement in environmental education and encourages active participation in conservation efforts. It also prevents abuse, trade, and destruction, and mandates the establishment of protected areas to maintain the balance in biodiversity.

In the classroom setting, the findings of this study can be integrated into teaching environmental science and biology. This would enhance the student's understanding of the avian species population dynamics by relating the ecological concept to real-life community issues. It promotes interdisciplinary learning in biology and geography, encouraging students to appreciate wildlife, biodiversity, and human-environment interactions. Students can participate in community-based activities, such as birdwatching or habitat observation, to connect science concepts to real-world practice. These activities strengthen environmental awareness, critical thinking, and civic responsibility. Socioeconomically, understanding avian population dynamics deepens the importance of sustainable ecological practices in protecting livelihoods tied to agriculture, aquaculture, and ecotourism—sectors vital to local and national development.

Hence, this research investigated the observed changes in avian species populations within the Lalaguna marshland ecosystem, utilizing the experiential knowledge of local communities. The study identified community-perceived contributing factors to avian population fluctuations and analyzed their impact on local livelihoods, focusing on communities directly reliant on the marshland's resources. Community-derived insights and recommendations helped inform the formulation of potential policy interventions to stabilize avian populations. The anticipated research output is a policy brief recommendation for conserving and stabilizing avian populations within the Lalaguna marshland.

Research Questions

This study focused on the fluctuating avian populations in Lalaguna Marshland and investigated the role of community awareness in conservation efforts. Specifically, it sought to answer the following questions:

1. According to local communities, what have been the observed changes in the population of avian species over the past few years?
2. What factors do local communities perceive contributing to the fluctuation of the bird population in Lalaguna Marshland?
3. How do avian population fluctuations affect local livelihoods, particularly those dependent on the marshland?
4. What conservation policies do the communities suggest to stabilize avian populations?
5. What proposed policy brief for avian population fluctuations can be derived from the research findings?

Methodology

Research Design

The researcher employed a qualitative research design, specifically narrative inquiry, in the study aimed at determining the observed changes in avian species populations over the past few years, as reported by local communities in Lalaguna Marshland. Likewise, it aimed to determine the local community's perception of the contributing factors that resulted in the fluctuation of the avian population in Lalaguna Marshland and how these fluctuations affect local livelihoods, particularly those dependent on the marshland. Lastly, it explored suggestions from the respondents on conservation policies. Do the communities suggest stabilizing avian populations in Lalaguna Marshland?

The findings of this study serve as the basis for crafting a policy brief that the respondents suggested and recommended to mitigate the avian population fluctuations in the Lalaguna marshland.

Respondents

The research participants of this study were 15 residents of Lalaguna Marshland, located in Lopez, Quezon. The researcher used purposive sampling since the participants had already been identified. According to Crossman (2018), a non-probability sample was selected based on the study's goal. The participants of the study were chosen based on the following criteria: (a) resident of Lalaguna Marshland, (b) resided in the community for about six years or above, (c) male or female, and (d) with knowledge and observation about the avian population in Lalaguna Marshland.

Instrument

The researcher used an interview guide as the primary research instrument to gather the necessary data. The interview questions were anchored in the problem statement to ensure alignment with the research objectives. The guide was open-ended and had follow-up questions, if necessary, to allow participants to share their experiences and insights.

The interview guide was also subjected to expert validation to ensure the validity and reliability of the content. Master teachers or school heads validated it. Their feedback would be used to refine the instrument before conducting the actual interviews.

Procedure

The data were gathered through in-depth interviews facilitated by the in-depth guide questionnaires among the 15 participants who have been residents of Lalaguna Marshland for about six years or more.

According to Adorno (2018), an in-depth interview, sometimes referred to as an intensive or in-depth interview, is a qualitative research technique that involves a planned discussion with a person to gain a comprehensive understanding of their viewpoints, experiences, and insights on a particular subject. Since these interviews are usually unstructured or semi-structured, examining themes and obtaining rich, in-depth information is relatively straightforward. They are frequently employed to study health practices, examine social phenomena, and comprehend consumer behavior. Researchers employ open-ended questions and probing strategies to elicit thorough answers and acquire a deeper understanding of viewpoints. Capturing the subtleties of individual experiences and attitudes is the aim, which frequently yields surprising themes and revelations. A helpful method for exploring complex problems, formulating hypotheses, and understanding unique experiences within a phenomenon or social context.

Before the in-depth interview process, a letter requesting permission to conduct the study was sent to the Local Government Unit of Lopez Quezon, where Lalaguna Marshland was located. Afterward, the researcher sent a letter to the respected barangay captains for approval to conduct the study, along with the approval letter and endorsement from the LGU of Lopez, Quezon. The researcher and respondents agreed upon the in-depth interview schedule based on mobility and convenience.

The in-depth interview method was utilized for this study during the actual data collection. Fifteen in-depth interviews were conducted among the 10 participants in the study. The researcher set a limit of fifteen participants for the in-depth interviews to obtain a thick description of their observations on avian population fluctuations in Lalaguna Marshland and how these fluctuations affect the people dependent on the marshland.

The researcher informed the participants about the purpose of the in-depth interview session and obtained their consent by having them sign the Informed Consent form. The researcher assured the participants that all information gathered would be kept confidential and used solely for research purposes. After signing the Informed Consent, the researcher clarified the ground rules for a successful in-depth interview and informed us that it would be done with the audio recording. Then, the discussion was facilitated. Documentation was gathered using notes and audio recordings.

After the fifteen in-depth interviews, the audio recordings from the 15 participants of the study were transcribed. The in-depth transcription was categorized based on the theme and sub-themes.

Data Analysis

The researcher employed thematic analysis to determine the factors influencing fluctuating avian populations in Lalaguna marshland while investigating the role of community awareness in conservation efforts (Lichtman, 2010, cited in Labrada, 2021). In this process, the audio-recorded responses from the participants were transcribed first. The researcher used an application to transcribe the audio recording and manually checked it to ensure the transcription was accurate. Subsequently, the coding of responses that share similar thoughts will be completed, followed by categorization based on the objectives of this research study. The researcher used manual coding. Finally, the answers were contextualized about the aim of the study, which was to create a theme.

Ethical Considerations

To ensure anonymity and privacy, the researcher obtained consent from each participant before conducting interviews and recording the dialogues. The primary participants were invited at a time and location that was convenient for them, where no one was able to hear their conversation. At the same time, the researcher performed a focus group discussion. No identifying information about the participants would be revealed in any form of communication or written output. Before conducting the study in the research location, the researcher obtained permission from the institution's identity. The researcher guaranteed that the data gathered would be utilized for the present study.

Subsequently, this research built a bond since a solid connection between the participant and the researcher is vital, ensuring that the interviewees feel relaxed in expressing their views and feelings on the variables being asked. However, the researcher also established some boundaries regarding the extent of closeness with the participants to ensure the validity of the information narrated would not be compromised, and the actual experiences would be accurately revealed.

Results and Discussion

This section deals with the presentation of data on fluctuating avian populations in Lalaguna marshland and investigating the role of community awareness in conservation efforts.

It begins with the observed changes in avian species populations over the years based on local community accounts. It then discusses the factors contributing to these fluctuations, including both natural and human activities. The chapter also examines the impacts of these changes on local livelihoods, the environment, and residents' well-being, especially those reliant on the marshland. Lastly, it outlines the conservation policies suggested by the communities to help stabilize bird populations and address related concerns.

Table 1. *Observed Changes in Avian Species Population Over the Past Years According to Local Communities*

Themes	*Number of Occurrence*	*Exemplar*
Increased in Population during Summer	6	"Dito, pag yung tag-init, madaming klase yung ibon na nalitaw .At saka pag yung madami dito ang maya, pag yung tag-ani." (P1) Here, during the summer, many kinds of birds appear.And when there are a lot of maya birds here, it's harvest season. "Pag winter po sa ibang lugar talagang may migratory, talagang may mga ibang klase pong ibon. Saka sinasabi rin naman ang mga DENR talagang meron daw migratory birds. Pero pag tag init marami po ibon dito." (P5) In winter, in other places, there are indeed migratory birds, there are indeed different types of birds. Then the DENR also says that there are indeed migratory birds. But in summer, there are many birds here.
Decreased in Population during cold season	6	"Dito kase ganyan lang ang mga ibon minsan isang grupo..marami sila..nawawala rin naman pag tag lamig." (P8) The bird population here fluctuates; sometimes there are large flocks, and other times they disappear. "Hmm parang narami naman.. pano minsan naman ay nawawala ay pag tag lamig na. Pero binabantayan naman ung mga ibon na lagi rito." (P9) It seems like there are a lot, but sometimes they disappear. However, the birds that are often here are being monitored.

Table 1 presents the themes that emerged in relation to changes in avian species populations as perceived by local communities. The themes include an increase in population during the summer and a decrease in population during the cold season.

Several studies support the seasonal variations observed in bird abundance and diversity, particularly the increase in populations during the summer months. Smith and Wallace (2018) observed a significant rise in bird abundance and diversity in temperate forests during the summer, attributing this change to migratory patterns and the breeding season behaviors of birds. This aligns with the responses of the participants, who noted seasonal increases in bird populations related to these same factors. Similarly, Rodriguez and Kim (2020) found that avian populations in urban and suburban areas experience a marked rise during summer, which they attributed to the abundance of food sources, nesting sites, and favorable weather conditions. These factors directly impact the availability of resources necessary for breeding and survival, reinforcing the seasonal changes discussed by the participants.

The following were the statement that provides proof for the above contention,

"Dito, pag yung tag-init, madaming klase yung ibon na nalitaw .At saka pag yung madami dito ang maya, pag yung tag-ani."(Participant 1)

"Pag winter po sa ibang lugar talagang may migratory, talagang may mga ibang klase pong ibon. Saka sinasabi rin naman ang mga DENR talagang meron daw migratory birds."(Participant 5).

"You can see, it just comes and goes, flying around. Ohh, that's how it changes..up and down, especially when it's hot."

Furthermore, Cheng and Thompson (2017) highlighted that songbirds in the Northern Hemisphere increase in certain regions during the summer months as a result of migration for breeding purposes. This migratory behavior directly correlates with the observed rise in bird populations, as participants mentioned the influx of migratory species during the breeding season. Meyer and Singh (2019) also examined the influence of temperature and vegetation density on bird population trends, finding that warmer temperatures and denser vegetation support higher bird densities during the summer. This study supports the idea that habitat and climate conditions play a crucial role in bird abundance, echoing the observations shared by the participants regarding the seasonal influence on bird populations.

Lastly, Alvarado and Peterson (2021) explored how the availability of food, particularly insects and fruits, during the summer months contributes to increased bird densities and diversity. The abundance of food sources in warmer months, as noted by the participants, supports higher bird activity and diversity, further validating the seasonal patterns observed in various environments. These studies provide a comprehensive understanding of the seasonal fluctuations in bird populations, aligning with the responses of participants who identified key environmental factors that drive these changes.

Another theme that emerged is a decrease in population during the cold season. The participants' observations regarding the declining number of bird species during winter are strongly supported by scientific findings. Rosenberg et al. (2019) present compelling evidence that North America has experienced a significant loss in bird populations since 1970, with declines particularly severe during the winter months. These widespread losses across habitats and species echo the participants' accounts of fewer birds being seen in familiar environments during the cold season. The following were the responses of the participants.

"Dito kase ganyan lang ang mga ibon minsan isang grupo..marami sila..nawawala rin naman pag tag lamig"(Participant 8)

"The bird population here fluctuates; sometimes there are large flocks, and other times they disappear."

Supporting this trend, Soykan et al. (2016) documented that approximately one-third of wintering bird populations in North America

have shown long-term declines. This extensive analysis emphasizes the value of long-term monitoring in identifying and understanding population changes, aligning with participant sentiments that changes in bird numbers are more noticeable now compared to past decades.

Environmental conditions have also been identified as a major factor influencing bird populations during winter. Muñoz-Salas et al. (2023) found that shorebird populations in temperate regions are not only declining but also responding to fluctuations in temperature and habitat quality. Participants' reflections on harsher winter conditions and their impact on bird visibility and survival support these findings.

Additionally, the U.S. Environmental Protection Agency (2014) notes that climate change is altering bird wintering ranges, often to the detriment of species that cannot adapt. Participants who mentioned shifts in the timing or location of bird sightings during colder months are observing real-time effects of these environmental changes. The correlation between altered wintering behavior and habitat suitability further affirms participants' perceptions.

Evidence from Acadia National Park provides a microcosmic view of this trend. The National Park Service reported a near 50% decline in winter bird populations since 1971, which supports respondents' concerns about long-term environmental changes reducing avian diversity in protected and natural areas alike.

Moreover, the relationship between temperature and bird survival is clearly demonstrated by Woodworth et al. (2017), who established that warmer winters tend to enhance population growth through improved survival rates. This scientific insight gives weight to participants' anecdotes, noting more bird activity during milder winters compared to colder ones.

Lehikoinen et al. (2021) also highlight that bird communities are adapting to climate change at a rapid pace during winter, often faster than during breeding seasons. This shift is reflected in participant comments about the increasing presence of warm-dwelling species and the disappearance of traditionally winter-dwelling ones.

Finally, Arthur Askeyev et al. (2024) underline the importance of geographic location, forest composition, and food supply in influencing bird distribution during winter. Their findings that bird abundance tends to drop later in the season parallel participant observations that bird sightings dwindle as winter progresses, likely due to harsher conditions and resource scarcity.

On the other hand, some studies have shown that certain bird species experience population increases during colder months. For example, Meyer and Singh (2019) highlighted that specific species, such as cold-adapted passerines, thrive in winter due to the abundance of winter grains and seeds, which are readily available in colder regions. These species, often well-adapted to harsher conditions, show a shift in their behaviors to take advantage of the resources available during the colder months. The implications of such findings suggest that while many species experience a boom in summer, others thrive in winter, highlighting the complex relationship between seasonal changes and avian population dynamics. This insight is important for understanding how different species adapt to seasonal changes, which could guide conservation efforts and habitat management strategies, particularly in the face of climate change

Table 2. *Contributing factors to the fluctuation of avian population in Lalaguna Marshland*

Themes	*Number of Occurrence*	*Exemplar*
Abundance of Food	7	"Maraming pagkain eh. Maraming pagkain kasi na malaya sila eh. Hindi naman yung binabaril na hinuhuli. Malaya talaga sila dito mamuhay."(P2) There's plenty of food here. They're free to eat whatever they want. They're not hunted or shot. They're truly free to live here "Isa po yung siguro yung area na yun is maraming available na food for species na nakikita dun."(P12) One thing is that that area probably has a lot of available food for the species that are seen there.
Seasonal Migration	5	"Sa pagbabago ng panahon. Pag mainit kase yan marami. Parang maunti sila pag taglamig. Yun ay sa nakikita ko lang ahh." (P6) It depends on the weather. When it's hot, there are a lot of them. It seems like there are fewer during the winter. That's just what I've observed, though. "During summer, kasi nakakalabas sila. Unlike pag maulan sa Lalaguna hinsi sila wala sila doon."(P9) During the summer, because they can go out. Unlike when it rains in Lalaguna, they are not there.

The themes contributing to the fluctuation of the bird population in Lalaguna Marshland are presented in Table 2. There is an abundance of food and seasonal migration.

Food abundance emerged as the primary theme contributing to the fluctuation and increase in bird populations in Lalaguna Marshland. The respondents consistently highlighted that the area provides an unrestricted and rich source of food for birds, with minimal human

interference, such as hunting. Because of this, birds are able to live freely and thrive in this habitat. The availability of food in the marshland, such as fish, plants, and other organisms, supports a stable and growing avian population. The participants said:

“Maraming pagkain eh. Maraming pagkain kasi na malaya sila eh. Hindi naman yung binabaril na hinuhuli. Malaya talaga sila dito mamuhay.” (Participant 2)

"There's plenty of food here. They're free to eat whatever they want. They're not hunted or shot. They're truly free to live here."

“Isa po yung siguro yung area na yun is maraming available na food for species na nakikita dun.” (Participant 12)

"Because maybe that's where their food is."

The study's findings are consistent with other research that has highlighted the importance of food availability in determining the dynamics of bird populations in diverse environments. Arévalo-Ayala (2024) investigated the effects of food quantity on various age groups in bird populations, emphasizing its significance for species survival and demographic stability. Similar to this, Margalida and Colomer (2025) investigated the effects of food accessibility on vulture populations, specifically in relation to sanitary rules, emphasizing the fine line that separates environmental regulations from species conservation. By examining how pollen analysis can serve as a proxy for the availability of food resources, Goodenough and Webb (2025) made significant contributions to this discipline and offered novel perspectives on bird conservation practices.

There has also been extensive research on the effects of food accessibility on endangered animals. Upon examining the dietary differences of the endangered Dupont's Lark in several geographical areas, Zurdo et al. (2024) demonstrated a clear connection between food supply and species sustainability. In their study, Chatelain et al. (2025) demonstrated how habitat changes lead to dietary modifications in birds by examining the impact of urbanization on bird populations, specifically by altering their access to local food sources. In a long-term study, Olsen et al. (2024) evaluated the population patterns of both marine and terrestrial bird species in the Faroe Islands and discovered that seabird survival is greatly impacted by changes in the oceanic food supply.

An additional study has been conducted on maritime environments and the implications of food stability in bird populations. Borboroglu and Reyes (2025) emphasized the importance of conservation activities targeting marine food supplies, particularly for penguins, whose survival depends on a consistent prey supply. Barracho et al. (2025) studied emperor penguin populations, focusing on the effect of food availability on juvenile survival rates. Ryan et al. (2025) expanded on this viewpoint by investigating changes in trophic ecology in maritime habitats, revealing how adjustments in food web dynamics affect bird populations, as well as other species.

These studies collectively demonstrate the significant connection between food availability and the stability of bird populations, highlighting the necessity of conservation efforts to guarantee avian species have access to sustainable food sources.

Seasonal migration is the second theme influencing the bird population. Respondents observed an increase in bird numbers during warm or dry months, particularly summer, and a noticeable decrease during cold or rainy seasons. This pattern aligns with migratory behavior where birds seek favorable climate conditions and optimal feeding or breeding environments, highlighting the adaptive strategies birds use to survive environmental changes.

The statements from particpants were as follows:

“Sa pagbabago ng panahon. Pag mainit kase yan marami.Parang maunti sila pag taglamig. Yun ay sa nakikita ko lang ahh. (Participant 6)

"It depends on the weather. When it's hot, there are a lot of them. It seems like there are fewer during the winter. That's just what I've observed, though."

“Ay sa palagay ko Mam ay ganun naman po baga talaga ang mga ibon. Dadayo sa isang lugar, aalis tas andyan na naman. Siguro po sa panahon rin.(Participant 9)

"I think that's just how birds are, Ma'am. They go to one place, then leave, and then they're back again. I guess it's also because of the weather"

According to the respondents' answers, seasonal changes are one of the factors influencing the volatility of the bird population. This means that the movements of birds are frequently determined by seasonal changes, with certain species appearing in greater numbers during warm weather and declining during colder weather. Birds migrate naturally in search of optimal living conditions, food sources, and breeding locations, reflecting these natural behaviors. The arrival, departure, and return cycles draw attention to how adaptable birds are to changes in their surroundings and support the notion that nature functions in dynamic, ever-evolving rhythms. Weather is a major factor in bird migration, affecting daily and regional population variations in addition to migration, providing insight into the complex relationships between climate and wildlife behavior.

The study's results align with those of other research, which show the substantial influence of weather and changing seasons on bird populations, corroborating the finding that warmer weather increases bird presence, while colder months cause a decrease. The demographic and population dynamics of scavenger bird species were studied by Arévalo-Ayala (2024), who focused on how seasonal

changes affect food availability and movement patterns. Likewise, Olsen et al. (2024) concluded that climate changes have a significant impact on the distribution of birds. The notion that birds migrate in response to changing climatic conditions was supported by Goodenough and Webb's (2025) further investigation into the effects of environmental factors, such as weather and food supply, on migratory behaviors. According to Zurdo et al. (2024), these results demonstrate how seasonal weather patterns affect population density and food support.

Building on these insights, it is evident that the behavioral patterns observed by participants are reflective not only of general migratory tendencies but also of localized adaptations to environmental stimuli.. Moreover, this movement is not merely a large-scale migratory event but also includes short-distance or altitudinal shifts that birds undertake to maintain access to necessary resources. This localized migration pattern may be particularly prominent in regions where microclimates significantly influence habitat suitability. Therefore, the respondents' observations highlight the importance of closely monitoring seasonal fluctuations, as they offer valuable indicators of ecological balance, potential shifts in climate norms, and their broader implications for biodiversity conservation.

Table 3. *Effects of fluctuations to local livelihoods, environment, lives of residents, and social welfare particularly those dependent on the marshland*

Themes	*Number of Occurrence*	*Exemplar*
No Perceived Effects on Livelihood	4	"Wari koy wala.. gawa ng Ang ibon naman, basta lang sila, doon lang sila. Hindi naman sila napunta sa mga... Basta doon lang sila sa kalawakan. Hindi naman sila napunta dito sa may kabahayan."(P1) It seems like they're just birds, doing their own thing. They're not going to... They just stay in the open spaces. They don't come near the houses. "Ay sa tingin ko ay wala naman. Gawa ng hindi naman po yan pinapakailaman ng mga tao rito. Kahit nga maya bawal pakialaman" (P6) I think it's because nobody bothers them. Even the sparrows are protected.
Dilapidated Crops	4	"Meron. Gawa ng..tulad ng mga maya dyan. Talagang apektado ang mga magtatalok dyan lalo pag tag ani halos wala silang aanihin pag dumami ang maya."(P4) Yes, like the sparrows there. They really affect the farmers, especially during harvest time. They eat almost everything, leaving the farmers with little to harvest if the sparrow population grows too large. Minsan pag may tanim nakakain ng maya. Yun pedeng walang maani pag ndi nabantayan." (P8) Sometimes, if there are crops, the sparrows eat them. If you don't keep an eye on things, you might not harvest anything.
Recreational and Therapeutic Value of Birdwatching	5	"Wala naman Mam pero maganda at nakakatuwa po silang panoorin. Siguro un po if stress ka ay nakaka relax sila panoorin ganun po." (P7) There's nothing wrong, Ma'am, but they're beautiful and fun to watch. If you're stressed, watching them is probably very relaxing. "Wala naman. maganda naman panoorin minsan ang mga ibon minsan marami sa umaga, minsan sa hapon." (P10) There's nothing wrong with it. It's nice to watch the birds sometimes, lots in the morning, sometimes in the afternoon.

The themes that emerged in Table 3 are as follows: no perceived effects on livelihood, dilapidated crops, and the recreational and therapeutic value of birdwatching.

Some participants believed that birds neither help nor harm their livelihood. They saw birds as distant or passive elements in their environment, not directly interacting with or affecting human activity or agriculture. This theme highlights a disconnect between the ecological contributions of birds (such as pest control or seed dispersal) and what is perceived as economically beneficial.

Several previous studies support the responses of participants regarding the perceived limited impact of birds on their livelihood. Marton et al. (2020) found that in agricultural settings, local farmers often do not consider birds as having significant contributions to their economic well-being. Even though birds offer valuable ecosystem services such as pest control and seed dispersal, these are frequently overlooked or undervalued by communities that tend to focus more on immediate and tangible sources of livelihood. This perspective aligns with the participants' views, highlighting a common disconnect between ecological functions and perceived economic benefits. According to the participants:

"Wari koy wala.. gawa ng Ang ibon naman, basta lang sila, doon lang sila. Hindi naman sila napunta sa mga... Basta doon lang sila sa kalawakan. Hindi naman sila napunta dito sa may kabahayan." (Participant 1)

"It seems like they're just birds, doing their own thing. They're not going to... They just stay in the open spaces. They don't come near the houses."

"Ay sa tingin ko ay wala naman. Gawa ng hindi naman po yan pinapakailaman ng mga tao rito. Kahit nga maya bawal pakialaman.." (Participant 6)

"I think it's because nobody bothers them. Even the sparrows are protected."

Additionally, Santiago et al. (2016) reported that farmers in Southeast Asia generally view birds as neutral elements in the farming environment, or at times, as minor pests. The economic impact of avian presence in rice fields was perceived as minimal or negligible, and cultural beliefs or limited awareness further contributed to the underappreciation of birds in agricultural discussions. This insight aligns with participants who did not recognize birds as playing a significant role in their farming practices or overall livelihood.

Further supporting this notion, findings from a study published in Agriculture, Ecosystems & Environment revealed that while some bird species are perceived as pests, most communities do not consider their presence to have a significant influence—positive or negative—on their agricultural profits. This reflects a broader misunderstanding or lack of awareness regarding the ecological roles birds play, particularly in pest management, and supports participants' sentiments about birds being largely irrelevant to their day-to-day livelihood.

Leach et al. (2015) also emphasized that community perceptions pose a challenge to conservation initiatives, particularly when wildlife, such as birds, is not viewed as integral to human survival or productivity. Their findings showed that birds are rarely considered either a threat or an asset in terms of livelihood, echoing the ambivalence expressed by participants in the current study.

Moreover, research by Cox and Gaston (2015) on human–bird interactions in urban environments noted that people often appreciate birds more for their aesthetic appeal than for any functional benefit tied to economic or social welfare. While this study focused on urban areas, it reflects a broader trend of underestimating birds' potential contributions to ecosystem services, which is consistent with the rural-based perceptions revealed by participants in this study.

Collectively, these studies support the participants' responses by illustrating a common theme: the ecosystem services provided by birds are often underrecognized or misinterpreted, leading to their exclusion from considerations of livelihood impact, both in rural and urban contexts.

Another theme is the dilapidated crops. The responses of the participants are strongly supported by existing literature that emphasizes the detrimental role birds play in agricultural settings. Several studies have highlighted that various bird species, including sparrows, starlings, and crows, are commonly recognized as pests in farmlands. These birds are known to cause substantial damage by pecking at ripening crops, fruits, and vegetables, ultimately affecting both yield and quality. Their feeding behavior disrupts not only harvest outcomes but also increases post-harvest losses, particularly when crops are left to dry in open fields.

“Meron. Gawa ng..tulad ng mga maya dyan. Talagang apektado ang mga magtatalok dyan lalo pag tag ani halos wala silang aanihin pag dumami ang maya.” (Particpant 4)

"Yes, like the sparrows there. They really affect the farmers, especially during harvest time. They eat almost everything, leaving the farmers with little to harvest if the sparrow population grows too large."

“Minsan pag may tanim nakakain ng maya. Yun pedeng walang maani pag ndi nabantayan.”(Participant 8)

"Sometimes, if there are crops, the sparrows eat them. If you don't keep an eye on things, you might not harvest anything."

Furthermore, the economic implications of bird-induced crop damage are significant. Tracey et al. (2007) emphasized the financial burden that farmers experience due to avian pests, highlighting that millions of dollars are lost annually in countries such as Australia and the United States. This economic strain stems from damage to staple and high-value crops such as sunflowers, rice, corn, and grapes. Financial losses often extend beyond the crops themselves, affecting broader agricultural productivity and the livelihoods of farmers.

The presence of specific bird species in particular crop environments also confirms the participants' observations. In rice fields, especially in Asian and African regions, species such as egrets, munias, and quelea birds are commonly observed causing substantial damage. Similarly, in fruit orchards, birds like crows, parrots, and mynas are frequent culprits. In grain-producing areas, pigeons, blackbirds, and starlings are often identified as the most destructive. These patterns suggest a strong correlation between crop type and the bird species involved in damage.

Locally, studies conducted in the Philippines support these findings. Research by the Philippine Rice Research Institute (2015) in Nueva Ecija noted that the chestnut munia and Eurasian tree sparrow are among the key species responsible for both pre- and post-harvest damage in rice fields. This aligns with participant testimonies concerning recurring losses in local rice farms attributed to birds. In a broader African context, FAO reports have identified the red-billed quelea as the most damaging bird pest, especially in sorghum and millet fields, reinforcing the idea that the issue is widespread and regionally specific.

Lastly, an assessment conducted in Karnataka, India, further substantiates these claims. Findings published in the Indian Journal of Ecology revealed that rose-ringed parakeets and house crows were responsible for more than 25% yield loss in sunflower fields. This data echoes the sentiments of farmers who have experienced substantial crop reduction due to unchecked bird activity. Collectively, these studies validate the perspectives shared by the participants, illustrating the persistent threat birds pose to agricultural sustainability across different regions and crop types.

Although the responses of the participants are supported by extensive literature highlighting the significant damage birds cause to crops and the corresponding economic burden on farmers, a notable contradiction arises from other studies that paint a contrasting picture. Research, such as that by Santiago et al. (2016) and Leach et al. (2015), reveals that many farming communities, particularly in Southeast Asia, perceive birds as neutral or minimally harmful, often due to cultural beliefs or a lack of awareness of birds' ecological roles. While scientific findings document the destructive impact of species like sparrows, starlings, and quelea birds on various crops, participant sentiments—mirrored in these more ambivalent studies—suggest a general underestimation of birds' influence on agriculture. This contradiction between empirical evidence of avian-induced crop loss and local perceptions of birds as irrelevant or aesthetically appreciated highlights a significant gap in knowledge dissemination and awareness at the grassroots level.

The recreational and therapeutic value of birdwatching is the final theme regarding how avian fluctuations impact the community's livelihood. The respondents observed the beauty and tranquility that birdwatching provides to individuals, highlighting its dual role as a visual appeal and a source of relaxation.

The variety of bird species, with their vivid colors and exquisite flight, captivates onlookers, transforming natural areas into destinations for wildlife aficionados seeking connections. Watching birds, whether with the naked eye or via telescopes, brings a sense of calm and relief from daily stress. It highlights how nature's basic yet captivating sights contribute to mental well-being, offering solace and delight to those who take the time to observe.

Lastly, birdwatching is more than just a hobby; it provides beauty and peace to people, underlining its role as both a visual appeal and a source of relaxation. The variety of bird species, with their vivid colors and exquisite flight, captivates onlookers, transforming natural areas into destinations for wildlife aficionados seeking a connection. The practice of observing birds, whether with the naked eye or through telescopes, offers a sense of calm and an escape from daily stress. It highlights how nature's basic yet captivating spectacles contribute to mental well-being, offering solace and delight to those who take the time to observe.

Finally, birdwatching is more than a hobby; it is a meditative activity that promotes awareness of biodiversity and the natural world's rhythms. It is a peaceful experience that promotes an awareness of biodiversity and natural rhythms. The respondents' answers were as follows:

“Wala naman Mam pero maganda at nakakatuwa po silang panoorin. Siguro un po if stress ka ay nakaka relax sila panoorin ganun po.” (Participant 7)

"There's nothing wrong, Ma'am, but they're beautiful and fun to watch. If you're stressed, watching them is probably very relaxing."

“Wala naman. maganda naman panoorin minsan ang mga ibon minsan marami sa umaga, minsan sa hapon. .” (Respondent 10)

"There's nothing wrong with it. It's nice to watch the birds sometimes, lots in the morning, sometimes in the afternoon."

The findings of this study correspond with prior studies that have highlighted the therapeutic and aesthetic benefits of birdwatching, emphasizing its importance as an activity that promotes well-being. White et al. (2023) investigated how birdwatching activities enhance mental health by reducing worry and increasing joy, underscoring the emotional connection between humans and birds. Hart (2024) investigated how exposure to bird noises can prevent cognitive decline and reduce loneliness, revealing the restorative potential of birds in promoting psychological health.

Similarly, Summers-Effler (2022) highlighted the moral and emotional value of birdwatching, arguing that it fosters a deeper appreciation for nature and enhances cognitive engagement. These findings are consistent with those of Hedblom et al. (2017), who found that experiences with varied bird species in urban environments increase the quality of life for city inhabitants by providing both visual enjoyment and psychological comfort.

Additional studies have shown that birdwatching has a larger impact on human health and environmental consciousness. Ratcliffe et al. (2020) investigated the role of birds' acoustic and visual qualities in reducing stress and promoting cognitive restoration, providing support for the notion that bird-related experiences offer tangible therapeutic benefits.

Kaplan (2024) also noted that observing birds can enhance mindfulness and offer a natural escape from the stresses of modern life. Andrews et al. (2024) investigated the cognitive and social effects of birdwatching, finding that it promotes community engagement and conservation initiatives.

Moreover, the participants' reflections affirm that birdwatching offers a form of passive engagement with nature that does not require specialized knowledge or equipment, making it accessible to many. Even in rural communities where livelihood concerns are paramount, the simple act of observing birds can bring moments of peace and connection. This underscores birdwatching's potential not only as a personal wellness activity but also as a low-cost, community-based tool for promoting mental health and environmental awareness in underserved areas.

Table 4 presents the themes of conservation policies that local communities propose for stabilizing the avian population. The emerging themes are Community stewardship and responsible governance in avian conservation, as well as environmental awareness through education and signage.

Table 4. *Conservation policies the communities suggest in stabilizing avian populations*

Theme	*Number of Occurence*	*Exemplar*
Community stewardship and responsible governance in avian conservation.	12	"Ang mga tao naman dito ay tumutulong sa pag alaga ng ibon. Siguro po ay isama sa pagbabantay. Ipaliwanag po baga Mam ang halaga po siguro ng ibon." (P7) The people here do help take care of the birds. Perhaps they could be included in the monitoring efforts. Maybe you could explain to them, Ma'am, the importance of the birds. "Siguro yung mga ordinace nila, strict implementation. Tsaka ung mga ordinance regarding sa garbage within the vicinity ng marshland dapat strict sila dun." (P15) Maybe their ordinances, strict implementation. Also, the ordinances regarding garbage within the vicinity of the marshland should be strict.
Environmental Awareness Through Education and Signage	6	"sa cellphone, sa facebook, messenger, yung mga ganun na lang. Saka sabi ko nga sa kanila kung nasa DENR na kase ito diba, bigyan nila ng oh ito yung ibon na ganito ganyan. Yung kahit sa papel na lang na ididikit."(P2) Just on their cell phones, Facebook, Messenger, that sort of thing. And I told them, since it's under DENR jurisdiction, they should put up signs—even just paper signs—with information about the birds. "Siguro magbigay ng magandang information education campaign na tinatawag. Siguro kailangan mas paigtingin pa yun para malaman nila kung gaano kaimportante ang gai bon sa buhay." (P13) Maybe provide a good information education campaign called. Maybe that needs to be intensified more so they know how important gai bon is in life.

The first theme emphasizes collaborative efforts between local communities and the Department of Environment and Natural Resources (DENR) in protecting bird populations in the Lalaguna Marshland. The respondents advocate for minimal human interference, prohibition of hunting or capturing birds, and consistent monitoring by both authorities and residents. Community members express a sense of shared responsibility, underscoring the need to coexist peacefully with the birds and maintain the ecological integrity of the. According to the respondents, it is essential that the community and the DENR work hand in hand, protecting the birds in Lalaguna marshland, and let them thrive without interfering with their existence there.

Ang mga tao naman dito ay tumutulong sa pag alaga ng ibon. Siguro po ay isama sa pagbabantay. Ipaliwanag po baga Mam ang halaga po siguro ng ibon. (Participant 7)

"The people here do help take care of the birds. Perhaps they could be included in the monitoring efforts. Maybe you could explain to them, Ma'am, the importance of the birds."

Pag masdan lang ang ibon. Wag barilin o hulihin. Bantayan ng DENR. Ng mga tao.. (Participantt 9)

"Just watch the birds. Don't shoot or catch them. The DENR and the people should watch over them."

Based on the results, the significance of responsible governance and community involvement in avian conservation can be inferred, stressing the narrow gap that separates human activity from bird population preservation. They emphasize the importance of local communities participating actively in conservation initiatives, the effectiveness of passive tactics that prohibit hunting and interference, and the necessity of ongoing education and awareness-raising to foster a culture of stewardship. In collaboration with regulatory agencies such as the DENR, these themes underscore the importance of creating a space where people and birds can coexist.

The study's findings are consistent with those of Kissui et al. (2021), who found that community-based conservation education programs are effective means of encouraging behavioral changes and long-term conservation success. The cooperative approach with regulatory agencies, such as the DENR, reflects the increasing awareness of the need for efficient governance structures that enable cooperation between local communities and government institutions in achieving conservation goals (e.g., Armitage et al., 2012). Additionally, studies demonstrating the substantial impact of human disturbance on avian populations confirm the efficacy of passive strategies that forbid hunting and direct interference (McKinnon et al., 2015; Wright et al., 2017).

Moreover, Environmental Awareness Through Education and Signage is another theme. This theme highlights the importance of strengthening conservation efforts by increasing environmental awareness. Educational interventions, particularly through visual materials such as signage, are recognized as vital tools in educating the public about the importance of avian species and acceptable behavior in protected areas.

Respondents believe signage could remind and inform both locals and visitors about bird protection policies and the significance of preserving biodiversity. Increasing environmental consciousness is crucial to preserving regional ecosystems and species. Along with explicit regulations under DENR's purview, educational signage that includes pictures and information on birds can aid in public education. By raising awareness, communities can promote responsible environmental behavior and foster a deeper appreciation for nature. As stated by the respondents,

"May.. kumbaga yung ipi print mo lang na ibon na maya oh ganito makikita yan sa Lalaguna, naka dyan naka ano sa mga ganitong ano dun sa Marshland." (Participant 2)

"They could just print out pictures of the birds—sparrows, for example—and put up signs saying, "These birds can be seen in Laguna, in this marshland area."

Yung mga lagyan ng sign na ipagbawal ang ganun..Ang mga hindi dapat. (Participant 5)

"They should put up signs saying it's forbidden to do those things—the things that shouldn't be done."

Promoting conservation initiatives and increasing public awareness of wildlife protection are two key objectives of environmental education. According to Pantoja et al. (2024), tourists' awareness of local biodiversity and laws is greatly increased by conspicuous signs and educational programs in protected zones, which encourages more conscientious environmental behavior. Moncayo Amador (2024) also investigated the function of environmental education initiatives and signage in protected areas, demonstrating how they reduce human disturbances to animals. Furthermore, to effectively manage human-wildlife interactions in protected zones and prevent ecological harm, Pawar and Mule (2024) emphasized the importance of strategic signage. Together, these studies confirm that instructional resources—such as signage—are crucial for fostering sustainable human-environment interactions and increasing public awareness.

The findings of this study served as the foundation for crafting a policy brief that outlines the recommendations based on the community perspective. The residents observed seasonal changes in the avian species population, notably an increase during summer and a decrease in the cold season. These fluctuations were attributed primarily to the availability of food and seasonal migration patterns. Although no direct impact on livelihood was reported, the community expressed concern over the decline of crops and the loss of the marshland's recreational and therapeutic value, especially for birdwatching. In response, the residents proposed conservation measures that emphasize community stewardship and responsible governance. They also advocated for heightened environmental awareness through education and the installation of informative signage. These community-driven insights were instrumental in shaping the policy recommendations presented in the brief, aiming to stabilize avian populations while preserving the ecological and social value of the marshland.

Conclusions

Based on the study's findings, the following conclusions were derived:

The study reveals significant seasonal fluctuations in avian populations, with increases during warmer months attributed to the abundance of resources and breeding behaviors. In contrast, colder months are associated with population declines, although some cold-adapted species persist, reflecting the complex seasonal adaptations that occur. Food abundance and seasonal migration are the main drivers of avian population changes in Lalaguna Marshland. These factors underscore the importance of ongoing ecological monitoring to inform effective conservation strategies. While some residents see no impact of bird fluctuations on their livelihoods, others report crop damage, especially from sparrows during harvest. This contrast highlights a disparity between local perceptions and the documented ecological and economic impacts of avian activity. Residents emphasize the need for environmental education, responsible governance, and community stewardship to manage avian populations. Collaboration between communities and authorities is essential to protect bird habitats and maintain ecological balance. Based on the research findings, a policy brief outlining community-informed strategies for managing avian population fluctuations in Lalaguna Marshland is presented. It advocates for conservation practices rooted in local knowledge, such as stewardship, governance, and awareness campaigns, to ensure sustainable environmental management.

Based on the study's findings and conclusions, the following recommendations are presented:

Further research should be conducted on the specific environmental variables that influence seasonal fluctuations in avian populations, including vegetation density, temperature, and food availability. Conservation strategies should integrate local ecological knowledge to better manage habitats during both peak and off-peak seasons, thereby ensuring year-round support for biodiversity. Regular monitoring of food resource patterns and migration trends in Lalaguna Marshland is essential to anticipate population shifts and guide conservation efforts. Researchers and local authorities should collaborate on long-term ecological studies to understand how resource availability shapes bird behavior and population dynamics over time. To address the disparity in community perceptions, it is recommended that participatory research be conducted, incorporating both economic assessments of crop damage and the valuation of birds' cultural and recreational benefits. Environmental education programs should also raise awareness about birds' ecological roles and promote practices that mitigate human-wildlife conflict. Programs that empower local communities to participate in conservation initiatives should be prioritized, especially those involving training in environmental stewardship and sustainable habitat management practices. Partnerships between local government units, NGOs, and residents can lead to more inclusive and impactful conservation outcomes, especially when informed by community-driven insights. Researchers should work with policymakers to develop a policy brief that reflects both scientific findings and community experiences regarding avian fluctuations. The brief should advocate for culturally sensitive conservation strategies that incorporate education campaigns, habitat protection policies, and co-management approaches aligned with local values and ecological needs. Future researchers should broaden the study to include a more thorough

understanding of bird dynamics in Lalaguna Marshland by investigating other factors that affect avian population variations, such as habitat degradation, climate change, and human activities.

References

Adorno, T.E. (2018). In-Depth Interview

Alderson, J. and Sander, H. A. (2021). Combining historical accounts with contemporary bird survey data identifies changes in an avian community over a period of anthropogenic change.

Adrian, V. C. C., Selene, G. P., Jordi, F., Irene, P., & Sofía, F. Á. (2025). Comprehensive analysis of West Nile Virus transmission: Environmental, ecological, and individual factors. ScienceDirect

Allen, A.M,Jngejans, E., de Pol, M., Frauendorf,M., der Sluijs,M and de Kroon H. (2021).The Demographic Causes of Population Change Vary Across Four Decades in a Long-lived Shorebird.

Andrews, J. G., Ammirati, R. J., & Andrews, C. J. M. (2024). Birding benefits: A review of mental health, cognitive, social, and conservation impacts. Ecopsychology, Liebert.

Anselmetto, N., Garbarino, M., Weldy, M., Bell, D., & Daly, C. (2024). Long-term data improve species distribution model performance.

Arévalo-Ayala, D. J. (2024). From local to regional: Demographic and population dynamics of a long-lived scavenger species in a changing environment.

Barracho, T., Le Scornec, E., Allain, J., & Bardon, G. (2025). Intrinsic and extrinsic drivers of juvenile survival in emperor penguins. Polar Biology, Springer

Bimmoy, E. (2024). Avifaunal Diversity and Conservation Challenges in the Magat Wetland of the Philippines: Assessing the Impacts of Habitat Loss and Management Strategies.Preprints. https://doi.org/10.20944/preprints202411.0477.v1

Borboroglu, P. G., & Reyes, L. M. (2025). Conserving Penguins via Land and Sea Protection. OAPEN Library.

Both C, Van Turnhout CA, Bijlsma RG, Siepel H, Van Strien AJ, Foppen RP (2015). Avian population consequences of climate change are most severe for long- distance migrants in seasonal habitats.

Chatelain, M., Rennstam Rubbmark, O., & Rudisser, J. (2025). Urbanisation and habitat shape resource-driven dietary shifts in wild birds.

Cowan, C. (2021). Philippines' rich bird life is more threatened than we thought, study says.

Cuervo JJ, Møller AP. (2017). Colonial more widely distributed, and less abundant bird species undergo wider population fluctuations independent of their population trend.

Curtis JR, and Robinson WD (2015). Sixty years of change in avian communities of the Pacific Northwest.

Donnelly, J. P. (2024). Flyway Bottlenecks: Migratory Waterbirds Confront Diminishing Wetland Networks in Western North America. ScholarWorks

Duda M. P. , Hargan K.E. , Michelutti N. , Blais J.M. , Grooms C. , Gilchrist H.G., Mallory M. L. , Robertson G.J. , Smol J.P. (2021). Reconstructing Long-Term Changes in Avian Populations Using Lake Sediments: Opening a Window onto the Past.

Ethier DM, Koper N, Nudds TD. (2017) Spatiotemporal variation in mechanisms driving regional scale population dynamics of a Threatened grassland bird.

Fink D, Auer T, Johnston A, Ruiz-Gutierrez V, Hochachka WM, Kelling S. (2020). Modeling Avian Full annual cycle distribution and population trends with citizen science data. Ecol Appl. 2020 doi:

Galewski T, Devictor V. When Common Birds Became Rare: Historical Records Shed Light on Long-Term Responses of Bird Communities to Global Change in the Largest Wetland of France.

Glennon MJ, Langdon SF, Rubenstein MA, Cross MS (2019). Temporal changes in avian community composition in lowland conifer habitats at the southern edge of the boreal zone in the Adirondack Park, NY

Goodenough, A. E., & Webb, J. C. (2025). Pollen analysis as a tool to advance avian research and inform conservation strategies. Ibis, Wiley. Full Text

Hart, J. (2024). Birding activities may prevent memory decline, decrease anxiety, and reduce loneliness. Integrative and Complementary Therapies, Liebert

Hedblom, M., Knez, I., & Gunnarsson, B. (2017). Bird diversity improves the well- being of city residents. Ecology and Conservation of Birds in Urban Environments, Springer.

Heingård, M.; Musser, G.; Hall, S.A.; Clarke, J.A. (2021). New Remains of Scandiavis mikkelseni Inform Avian Phylogenetic Relationships and Brain Evolution. Diversity

Hutschenreiter, A., & Andresen, E. (2024). How to count bird calls? Vocal activity indices and bird abundance. Wiley Online Library Indeed, Editorial Team (2024). In-Depth Interviews: Importance, Process And Benefits

Ivanitskii, V. V., & Marova, I. M. (2024). Avian song over time: Variability and stability.

Kaplan, Y. (2024). The Wondrous Outdoors. Nature Therapy, Google Books.

Kissui, B. M., et al. (2021). Community-based conservation and its effectiveness in biodiversity management: A review. Journal of Biodiversity and Environmental Sciences, 17(3), 1-16

Kittelberger,K.D, Tanner, C. J., Orton, Nicolas D., Şekercioğlu, C. (2023).The value of community science data to analyze long-term avian trends in understudied regions: The state of birds in Türkiye,Avian Research,Volume 14

Kumar, S., Choudhary, A. K., & Kumari, P. (2025). Ecological Study of Indian Pond Heron and Gray Heron in Wetlands of Udaipur and Chittorgarh Districts of Rajasthan, India.

Lado, I., Alfaro, M., Arim, M., Borthagaray, A., & Fascioli, S. (2024). Temporal variability in species richness and population trends of birds. Revista Ecosistemas

Lee, SD., Kang, HK. (2019). Seasonal fluctuations and changing characteristics of a temperate zone wetland bird community.

Limbaro, G.L (2024). Diversity of bird species in Ebpanan Marsh, Maguindanao del Norte, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines

Li, Z. Q., & Liu, X. R. (2024). Urban bird nest building on man-made structures: A review. Zoological Research: Diversity and Conservation

Mallari NAD, Collar NJ, Lee DC, McGowan PJK, Wilkinson R, Marsden SJ (2021). Population densities of understorey birds across a habitat gradient in Palawan, Philippines: implications for conservation. Oryx.

Margalida, A., & Colomer, M. À. (2025). Demographic effects of sanitary policies on European vulture population dynamics: A retrospective modeling approach. Ecological Applications, Wiley.

Marigmen, M. (2023) Waterbirds in the Wetlands of Casiguran, Aurora, Philippines. Open Journal of Ecology, 13, 248-256. doi: 10.4236/oje.2023.135016.

McKinnon, M. C., et al. (2015). A global assessment of human-induced land cover change and its impact on terrestrial vertebrate biodiversity. Conservation Biology

Martins, C. O, Zakaria, M., Olaniy, E.O, and Angela, U. O (2019). Population Density of Avian Species in a ManMade Wetland of Peninsular Malaysia

Mendez, V., Gill, Jennifer, A., Alves, Jose A., Burton, N.H. K, and Davies, R. G. (2017). Consequences of population change for local abundance and site occupancy of wintering waterbirds

Moncayo Amador, B. N. (2024). Diseño de un código de ética para los visitantes del Área Nacional de Recreación Playas Villamil. ESPOL Repository

Naik, V. K., Akhter, S., Naladi, B. J., Rathore, A., & Yadav, P. (2024). The Ecological Impact of Pesticides on Non-Target Organisms in Agricultural Ecosystems.

Nykytiuk, Y., & Tkachuk, R. (2024). The ecological traits of birds in the context of climate change impact on their ranges. Agrology Journal

Olsen, I., Hammer, S., Dinesen, L., & Sonne, J. (2024). Population trends of marine versus terrestrial bird species on Skúgvoy, Faroe Islands (1961–2023). Bird Study, Taylor & Francis.

Osazuwa, C. M., Peter, O. A., & Oghogho, M. Y. (2024). Role of Community-Based Conservation in Ekiti State. The American Journal.

Palmer, G., Stephens, P., Ward, A. (2015). Nationwide trophic cascades: changes in avian community structure driven by ungulates

Pandey, C., Bhatia, G. S., Damle, K. L., Thiske, S., & Ali, M. (2024). Diversity and Abundance of Wetland Avian Fauna of Rajnandgaon District, Chhattisgarh, India. PDF

Pantoja, M., Pazos, V., & Albala, P. (2024). Impact of the New Master Plan for Brasília Zoo 2057-Brazil: A Comprehensive and Propositive Analysis. E3S Web of Conferences

Pawar, P., & Mule, M. (2024). Ecological and Anthropogenic Factors Predicting Occupancy of Seven Ungulate Species in Gautala Autramghat Wildlife Sanctuary, Western India. SSRN

Ramírez F, Navarro J, Afán I, Hobson KA, Delgado A, Forero MG (2012). Adapting to a changing world: unraveling the role of man-made habitats as alternative feeding areas for slender-billed gull (Chroicocephalus genei)

Ratcliffe, E., Gatersleben, B., & Sowden, P. T. (2020). Predicting the perceived restorative potential of bird sounds through acoustics and aesthetics. Environment and Behavior, Sage Journals.

Ryan, J. P., Oestreich, W. K., & Benoit-Bird, K. J. (2025). Audible changes in marine trophic ecology: Baleen whale song tracks foraging conditions in the eastern North Pacific.

Saether BE, Grotan V, Engen S, Coulson T, Grant PR, Visser ME, Brommer JE, Rosemary Grant B, Gustafsson L, Hatchwell BJ, Jerstad K, Karell P, Pietiäinen H, Roulin A, Røstad OW, Weimerskirch H. (2016). Demographic routes to variability and regulation in bird populations.

Sæther, BE., Lande, R., Engen, S. et al. (2005) Generation time and temporal scaling of bird population dynamics. Nature.

Smith LA, Chow-Fraser P. (2010). Impacts of adjacent land use and isolation on marsh bird communities. Environ Manage.

Sain, S. K., Sabesh, M., & Prasad, Y. G. (2024). A Field Guide for Symptom-Based Identification and Management

Song, Z., Gao, S., Leng, M., Zhou, B., & Wu, B. (2024). Quantifying the ecological performance of migratory bird conservation: Evidence from Poyang Lake Wetlands in China. Biology, MDPI.

Summers-Effler, E. (2022). The morality of birding: Aesthetic engagement, emotion, and cognition. Theory and Society, Springer.

Thorne KM, Spragens KA, Buffington KJ, Rosencranz JA, Takekawa J. (2019). Flooding regimes increase avian predation on wildlife prey in tidal marsh ecosystems.

Tozer, D. C. (2016). Marsh bird occupancy dynamics, trends, and conservation in the southern Great Lakes basin: 1996 to 2013,Journal of Great Lakes Research,

Tryjanowski, P., Yang, X., Zhang, L., Jiguet, F., Han, Z., & Chen, J. (2025). Distribution pattern and niche overlap of sympatric breeding birds along human-modified habitat gradients in Inner Mongolia, China. Avian Research.

Varriano, S., Snyder, W. E., & Smith, J. C. (2025). Deterring Wild Birds during Fruit and Vegetable Production. Food Protection Trends

White, M. E., Hamlin, I., Butler, C. W., & Richardson, M. (2023). The joy of birds: The effect of rating for joy or counting garden bird species on well-being, anxiety, and nature connection. Urban Ecosystems, Springer.

Wright, J. P., et al. (2017). The impact of human disturbance on wildlife: A review and synthesis. Biological Conservation, 213, 223-234.

Zagorskaya, V. V., Ravkin, Y. S., & Kokorina, I. P. (2024). Spatial and temporal variability of the bird population of Ufa. Springer

Zelelew, S. A., Getnet, M., & Ashagrie, M. (2024). Influence of Seasonal Variations and Vegetation on Bird Composition and Foraging Guilds in the Selected Church Forests of the Southwestern Lake Tana Watershed. SSRN

Zielonka, N. (2024). Biodiversity and ecosystem services in fruit farms: The roles of management and semi-natural habitats.

Zurdo, J., Bustillo-de la Rosa, D., & Barrero, A. (2024). Spatio-temporal variation of the endangered Dupont's Lark diet across Iberia and Morocco. PLoS ONE. Full Text.

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