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Utilizing Drones for Tracking Wild Life Conservation: Tracking Census and its Anti Poaching Efforts

Nidhi Sahu[1], Rohit Singh Lather[2,*], Deepak Kumar Bhalla[3]

Abstract

Remote-controlled conservation drones can gather data from hard-to-reach locations with the least amount of disruption. Drones are being employed more and more in various research fields, but there is still much to learn about how they might be applied to wildlife study. Remote-controlled conservation drones can gather data from hard-to-reach locations with the least amount of disruption. Drones are being employed more and more in various research fields, but there is still much to learn about how they might be applied to wildlife study. This study details the usage of Phantom 2 Vision+ for area monitoring in two South Korean national parks. The first research site was located in Chiaksan National Park, while Taeanhaean National Park served as the second research site. The purpose of this study is to present conservation drones to ecologists and scholars alike, demonstrating how these innovative instruments are essentially advancing the field of natural science. This study details the usage of Phantom 2 Vision+ for area monitoring in two South Korean national parks. Research was done in two different national parks: Taeanhaean National Park and Chiaksan National Park. The purpose of this study is to present conservation drones to ecologists and scholars alike, demonstrating how these innovative instruments are essentially advancing the natural sciences. We also acquired images and recordings of observation zones in our testing facility. The Ecological Society of Korea, copyright 2015. All rights reserved. We also obtained photographs and video monitoring areas within our test sites.

Keywords: Drone, Ecology, Phantom 2 Vision+, Unmanned Aircraft Systems (UAS), wildlife

INTRODUCTION

Unmanned aerial vehicles (UAVs), also referred to as drones, have garnered a lot of attention in a variety of industries in recent years because of their affordability, ease of use, and versatility. Of all the uses, one that sticks out as having particularly high potential for drones is wildlife protection. This introduction explores the use of drones in animal conservation, highlighting its functions in tracking, carrying out surveys, and stopping poaching. (Figure 1) A vital effort to protect the planet's biodiversity and guarantee the survival of many species is wildlife conservation. Conventional wildlife monitoring techniques, such physical tracking and ground surveys, can be dangerous, time-consuming, and labor-intensive. Drone technology has made it possible to track wildlife and conduct conservation initiatives in new and creative ways in recent years. This study examines the use of drones in wildlife conservation, with a particular emphasis on tracking census and anti-poaching initiatives [1–3].

***Author for Correspondence**
Rohit Singh Lather
E-mail: rohitsinghlather@gmail.com

[1]Research Scholar, Department of Mechanical Engineering, Lingaya's Vidyapeeth, Faridabad, Haryana, India
[2]Head, Department of Multidisciplinary Engineering, The NorthCap University, Gurugram, Haryana, India
[3]Director, Department of Mechanical Engineering, Lingaya's Vidyapeeth, Faridabad, Haryana, India

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Background

There are several obstacles facing wildlife conservation, such as habitat loss, climate change, and illicit poaching. For effective conservation management, wildlife populations must be accurately

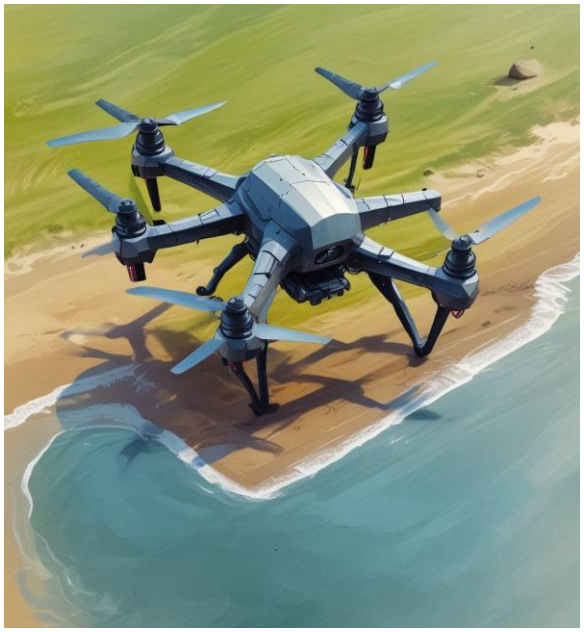

Figure 1. Drone.

Figure 2. Ecology.

and effectively monitored. Although valuable, traditional approaches are severely limited in terms of accuracy, speed, and coverage. Unmanned aerial vehicles (UAVs), popularly referred to as drones, present a viable answer to these problems by giving surveyors an adaptable and effective way to cover vast and frequently inaccessible regions [4].

Importance of Drones in Wildlife Conservation

Drones with sophisticated sensors and high-resolution cameras can record and take comprehensive pictures and movies, which is useful information for tracking wildlife. They are perfect for population counts since they can cover large regions fast and with little disruption to the natural environment. This functionality is especially important in areas where ground surveys are problematic due to topography or dense vegetation (Figure 2).

Drones are not only useful for monitoring animal populations but are also becoming an effective weapon against poaching. Due to the size of protected areas and scarce resources, traditional anti-poaching efforts frequently prove ineffective in combating the serious threat that poaching poses to numerous endangered species. Drones can be used to quickly deploy anti-poaching measures, monitor protected areas in real-time, and detect illicit activity teams, improving the efficiency of conservation initiatives [6–8].

Objectives of the Study

The primary objective of this research is to evaluate the effectiveness of drones in wildlife conservation, with a focus on their application in tracking census and anti-poaching efforts. This study aims to:

1. *Assess the accuracy and efficiency of drones in wildlife population censuses:* By comparing drone data with traditional ground survey data, this study will evaluate the reliability of drones in estimating wildlife populations.
2. *Evaluate the impact of drones on anti-poaching efforts:* This includes analyzing the success rate of drone-assisted anti-poaching operations and assessing the deterrent effect of drone surveillance on poachers.
3. *Identify challenges and limitations:* The study will explore the technical, logistical, and ethical challenges associated with the use of drones in wildlife conservation and propose potential solutions.
4. *Develop best practice guidelines:* Based on the findings, this study will provide recommendations for the optimal use of drones in wildlife conservation initiatives.

Significance of the Study

The results of this study have the potential to completely change the way that wildlife conservation programs are implemented by highlighting the useful advantages and constraints of drone technology. This study intends to aid in the creation of more efficient and long-lasting conservation techniques by offering a thorough review of drone applications in wildlife tracking and anti-poaching. In the end, using drones for wildlife conservation may result in better population tracking, stronger safeguards for threatened species, and a sharp decline in illicit poaching [9].

Structure of the Paper

The format of the paper is as follows: The literature on drone technology and wildlife conservation is reviewed in the following section. A thorough explanation of the study's methodology is then provided. The outcomes of the drone-assisted wildlife tracking and anti-poaching activities are shown in the results section. The results are interpreted and the consequences, difficulties, and future directions are discussed in the discussion section. Ultimately, the conclusion provides a summary of the most important findings and suggestions for legislators and environmentalists.

This research intends to identify creative solutions that can improve the efficacy of conservation efforts and preserve the survival of the planet's priceless species by examining the potential of drones to alter wildlife conservation [10].

The Value of Conserving Wildlife

Wildlife protection is essential to preserving biodiversity and the equilibrium of the ecosystem. Declines in animal populations due to illegal poaching, habitat degradation, and climate change pose a severe danger to biodiversity worldwide. Effective conservation strategies are essential to preserving ecosystem viability and protecting endangered species. Conventional methods of monitoring and conserving wildlife, like ground and manned aerial surveys, are labor-intensive and costly, and they occasionally cannot adequately cover broad and challenging-to-reach areas [11, 12].

The Advent of Unmanned Aerial Vehicles

The advent of drone technology has brought about a revolution in the field of wildlife conservation. Drones have several advantages over traditional methods, including the ability to access locations that are difficult to access, deliver high-quality imagery, and collect data in real-time. Making informed decisions regarding conservation is made easier by the vast volumes of data that drones equipped with advanced sensors and cameras can gather and transmit about wildlife populations and their habitats. Ecology is just beginning to explore the use of robots in its operations. (Figure 3) However, because of their recent spike in popularity, several research teams across the globe are working very hard to develop as many novel applications for these small devices as they can. Thus far, their most popular applications have been mapping the local wildlife and keeping an eye on formerly inaccessible areas. Ecology has only become a vibrant subject of study in the last fifty years, as the consequences of climate change on the lives of humans and animals alike become evident. Since then, ecologists have developed methods to monitor and assess the consequences of ongoing global change, improve the biodiversity of Earth's system, and predict how ecology will develop in the future. To achieve these goals, drones have made it feasible to monitor the Earth swiftly, correctly, a completely—something that is currently quite effective [13, 14].

Following Wildlife

Tracking animal movements and activities is crucial to understanding a species' ecology and implementing effective conservation strategies. Drones equipped with GPS and thermal imaging sensors enable researchers to monitor the movements of various species while causing the least amount of disturbance to their natural habitats. This ability is particularly useful for studying migration trends, identifying significant habitats, and assessing the effects of environmental changes. The con sonic signals coordinate a path to be followed and notify the researcher of their location. (Figure 4) Depending

Figure 3. Phantom 2 Vision+.

Figure 4. Wild life.

on their complexity, some are also equipped with 3D motion sensors, which enable them to detect and avoid approaching things without the researcher's help (Koh 2013). The drones have optical sensors installed, which can identify ultraviolet and/or infrared light. To collect ecological data, two types of sensors are used: acoustic sensors, which are primarily used underwater but can also be used on land, and physical sensors, which monitor temperature, pressure, humidity, and conductivity [15].

Performing a Census

A precise estimate of the animal population forms the basis of every conservation effort. Traditional census methods can be challenging and prone to inaccuracy, such as ground surveys and manned aerial counts. Drones can be used to conduct wildlife surveys more effectively and correctly. By capturing high-resolution aerial imagery, drones can cover large areas fast and provide a wealth of data on population sizes, distribution, and density. Determining the conservation status of a species and developing effective management plans require this data. The conservation drone is a model airplane with autopilot. The autopilot unit consists of a computer, a GPS, a compass, a barometric altimeter, and a few more sensors. A conservation drone is made to carry valuable payloads, such as a video or picture-taking camera. Additionally, software that enables the user to create missions and turn on useful commands and features must be installed. Based on factors including size, mobility, autonomy, equipment, and intended usage, drones are categorized into numerous groups. For example, most drones rely on advanced positioning systems, which often employ WiFi or a GPS sensor to fly autonomously with the help of ground control inputs, or to follow a predetermined itinerary. underwater operating drones. A detachable 4GB micro SD card and an incredibly high-quality camera are included with the Phantom 2 Vision+. It records full HD footage at 1080p/30 fps and 720p/60 fps, giving the researcher both slow motion and incredibly clear videos. 14 megapixels are used for taking photos. An integrated, highly precise 3-axis smooth flight and complete control of the aircraft in the air are ensured by a 3-axis camera stabilization system [16].

Anti-Poaching Initiatives

Poaching is still one of the greatest threats to animal conservation, driving many species closer to extinction. Drones are an important tool in the fight against poaching. Because drones can cover broad areas, they can quickly discover and deter poachers. Drones equipped with thermal and night vision capabilities can operate continuously, boosting the effectiveness of anti-poaching teams and providing continuous monitoring. In order to anticipate poaching hotspots and improve patrol routes, drones can also be employed in conjunction with other technologies such as artificial intelligence and machine learning [17].

METHODOLOGY

Study Area

A recognized wildlife protection area renowned for its varied flora and animals served as the study's site. This region has a variety of wide grasslands, deep forests, and wetlands, making it a thorough landscape for assessing how well drones perform in different environments. The research area is a well-known hub for illicit poaching, which makes it a perfect place to evaluate how drone technology affects anti-poaching initiatives.

Drone Hardware and Details

We used a fleet of drones outfitted with GPS tracking, thermal imaging sensors, and high-resolution cameras for this study. Among the particular models employed were:

1. *DJI Phantom 4 Pro:* Perfect for in-depth visual surveys, this drone has a 20-megapixel camera that can record 4K video.
2. *DJI Matrice 200:* Equipped with a thermal imaging sensor to identify animal heat signatures, this device is helpful for anti-poaching efforts and nighttime surveillance.
3. *SenseFly eBee:* A fixed-wing drone used for extensive population censuses that can cover enormous areas quickly.

Data Collection Procedures

- *Survey design: Design of the wildlife population census survey:* Drone flights were scheduled to cover each grid segment in a methodical manner after the study area was partitioned into a grid. To provide thorough coverage, flight paths were pre-programmed using specialist software.
- *Flight execution: Execution of the flight:* Depending on the topography and quantity of foliage, drones were flown between 100 and 200 meters in the air. For thirty to sixty minutes, each flight produced high-definition photos and movies.
- *Data processing: Data processing:* To identify and count individual animals, collected data were analyzed using image recognition software. In order to evaluate the accuracy of drone-assisted censuses, this data was then compared with data from conventional ground surveys.

Anti-Poaching Initiatives

- *Real-time monitoring:* Early in the morning and late at night, when poaching is most active, drones fitted with thermal imaging sensors were used. At a central command center, a team kept an eye on the live feeds (Figure 5).

Figure 5. Anti-poaching initiatives.

- *Patrol coordination:* Drone operators were able to quickly respond by providing ground patrol teams with real-time coordinates upon detecting suspicious activity. These therapies' efficacy was noted and evaluated.
- *Analysis of the deterrent effect:* To determine the degree to which the presence of drones discourages poaching, the local population was informed about their existence. To collect qualitative data, interviews were done with known poachers and local inhabitants.

Data Analysis

- *Population census data analysis accuracy:* To compare the counts with those from ground surveys, statistical techniques were used to the data collected by drones. Calculations were used to determine metrics like recall, precision, and total accuracy.
- *Anti-poaching effectiveness:* By comparing the number of poaching occurrences that occurred before and after drone deployment, the effectiveness of interventions aided by drones was assessed. Response times and the quantity of poachers arrested were also examined [19].
- *Challenges and limitations:* The study's logistical limitations, weather-related difficulties, and technical problems were all recorded. The usage of drones in wildlife areas raises ethical questions that were also examined.

Ethical Considerations

- *Animal welfare:* Steps were taken to make sure that drone flights wouldn't put animals through excessive stress or disrupt them. In order to reduce the impact, flight durations and altitudes were carefully managed.
- *Community involvement:* The goals and findings of the study were communicated to the local communities. An attempt was made to include the community in anti-poaching campaigns, encouraging a sense of shared responsibility and cooperation.
- *Data security:* Only authorized individuals were able to access the safely kept data. To preserve the privacy of the interviewees, their personal information was anonymised [20].

Limitations of the Study

- *Weather dependency:* Unfavorable weather, such as intense rain or wind, restricted drone operations and can have an impact on the consistency of data collecting [21, 22].
- *Technical problems:* Periodic technical problems, such as dead batteries and lost connections, made it difficult to keep track of everything.
- *Study area scope:* Because the study was limited to a particular conservation area, its conclusions might not be immediately transferable to other areas with differing biological and socioeconomic conditions [23, 24].

CONCLUSION

The above-mentioned technique seeks to offer a thorough assessment of drones' usefulness in animal conservation initiatives. This study aims to contribute to the creation of creative and sustainable conservation strategies by fusing quantitative data from drone surveys with qualitative ideas from community participation.

Unprecedented opportunities to enhance tracking, censusing, and anti-poaching activities in the field of animal protection are presented by the incorporation of drone technology. Drones' capacity to deliver real-time data, boost accuracy, and facilitate access to remote areas puts them in a position to become an indispensable tool in the battle to protect and preserve the planet's biodiversity. As drone technology advances, it's expected to be utilized more frequently in wildlife conservation, creating opportunities for more innovative and effective conservation strategies.

A key consideration in the development of conservation drones is their ease of use for non-specialist operators, such as field ecologists and conservation professionals (Koh and Wich 2012). Because of the

drone's precise and easy-to-use data collection capabilities, almost anyone can utilize it for a variety of natural science applications because of its ability to be precise and detailed. This is a significant breakthrough in UAV development and application that surpasses initial military expectations. By presenting the fundamental ways in which these new technologies are advancing biodiversity monitoring, this paper seeks to educate ecologists and researchers alike about conservation drones. The pictures and data that have been collected thus far consist

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2. "In Defense of Wildlife: The Realities of Using Drones for Anti-Poaching"(2022) - This piece delves into the complexities of using UAVs for anti-poaching missions, differentiating between response and prevention missions, and discussing the technological and logistical challenges involved. Read more on Wildtech Mongabay
3. "Using Drones for Anti-Poaching: First, Know Your Mission" (2023)- The article stresses the importance of understanding the mission requirements when deploying UAVs for anti-poaching. It provides insights into selecting appropriate drone technology based on specific conservation needs and environmental conditions. Read more on Mongabay News
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