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Exploring the Cultural and Ecological Importance of Turtle Doves (*Streptopelia Orientalis*) in Malakand Division, Northern Pakistan

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Abstract

*The turtle dove (*Streptopelia orientalis*), known locally as "Taroranga" or "Kanra Kontara," plays a crucial role in Northern Pakistan's cultural and ecological landscape. Despite being a favourite local hunt, there is limited literature on its life aspects and conservation status. This study investigates the bird's morphology, cultural significance, population dynamics, feeding behaviour, and threats. Turtle doves are culturally symbolic, tied to seasonal changes and traditional medicinal practices for seven ailments. Population variations highlight the need for localized conservation, with unsustainable hunting identified as a significant threat. Urban activities, noise, and pesticides contribute to habitat loss and disturbance. Classified as "Vulnerable" by IUCN, urgent conservation measures like awareness of local people and regular monitoring are recommended for sustainable management. Collaborative efforts from academic researchers, Bird Life International, and local conservation groups are crucial for the species' well-being.*

Key Words: *Streptopelia orientalis, Wildlife, Migratory birds, Turtle dove, Conservation*

1. Introduction

Turtle doves (*Streptopelia orientalis*) are migratory birds that hold cultural, ecological, and aesthetic significance in Northern Pakistan. Their melodious calls are interwoven into local traditions and folklore, symbolizing the arrival of seasons and inducing a sense of connection to nature (Browne & Aebischer, 2003; Browne & Aebischer, 2004; Smith, 2017). These cultural associations highlight the need for a comprehensive study in relation to various dimensions of turtle dove ecology, including population status, habitat preferences, migration patterns, and local threats.

Their complex migratory journeys, spanning continents, make them fascinating subjects of study, particularly within regions such as Northern Pakistan, a significant stopover site along their migratory routes (Pathan et al., 2014; Sadam & Mahmood, 2021). Their migratory behaviour exposes them to numerous challenges, encompassing habitat degradation, climate change, and human-induced disturbances. Therefore, understanding their population

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dynamics, feeding behaviour, and the operating threats are crucial for their conservation and the preservation of ecosystem integrity.

The decline of turtle dove populations across their European breeding ranges in recent years has raised alarm within the conservation community and scientific circles (Moreno-Zarate et al., 2020). This decline is attributed to various factors including habitat degradation, intensified agricultural practices, and changing climatic patterns (Dunn et al., 2018). Consequently, understanding their relation with various factors which influence their life behaviours has emerged as a priority, underscoring the urgency of research endeavours. Therefore, the current study was designed primarily, through the involvement of local community and field observations, this study aims to provide an accurate assessment of their population, migration, overall threats and conservation status (Bibby, 2000; Bibby, 2004). Furthermore, identifying the relations between habitat selection and species survival, careful analyses of their habitat preferences are required, using methodologies such as vegetation assessments and field observations (Walker et al., 2020). Not only identification of critical ecological features driving their choice of habitats, but also understanding the migratory behaviour of turtle doves is important for their conservation. By employing group discussion and literature study this study aims to trace their migration routes, identifying their stopover sites, and assess potential threats encountered during their long journeys (Klaassen, 2014). Assessment of their migration routes and flyways will provide insights into their relations with different geographic regions, this will contribute to prepare cross-boundary conservation strategies.

Furthermore, their feeding behaviour links them with ecosystem dynamics and resilience (Eraud et al., 2013). Comprehensive observations of their diet composition, feeding behaviour, and interactions with plants will provide information's about their roles as ecosystem service providers. Similarly, gaining insights into their reproductive biology, including nesting site preferences and parental care, are important for planning strategies that can ensure their successful breeding (Reif, 2013).

Many studies are reported from different parts of the world about decline of turtle dove populations over the past few years due to various reasons. Therefore, the current study was designed to contribute to our knowledge about population dynamics, feeding behaviour, and conservation status of Turtle doves in Northern Pakistan.

2. Materials and Methods

2.1 Study Area and Site Selection

A purposive sampling approach was used to select study sites that had historical significance and where the presence of turtle doves was culturally recognized. Collaborations with local communities, elders, and cultural experts guided the identification of suitable sites. The study covered four distinct study sites of Northern Pakistan which were consist of District Buner, District Swat, District Dir (Lower) and District Shangla. These sites represent different elevation (asl), diverse landscapes and vegetation types, ranging from open habitats at District Buner to semi-mountainous region at District Swat and District Dir (lower), and forested mountainous regions at District Shangla (Figure 1). Geographic coordinates and elevation profiles were recorded using GPS units to accurately define the study areas (Table 1)

Table 1: Observation Stations with Geophysical Location (m) and Altitude (ASL).

S. No	District	Study station	Geophysical Location	Altitude(m)
1	Buner	Shalbandai	34° 29' 43" N 72° 10' 10" E	709
2	Swat	Parrai	34°41' 54" N 72° 13' 58" E	803
3	Dir (Lower)	Munda (Jandool)	34° 50' 04" N 71° 38' 36" E	866
4	Shangla	Kotky	34°51' 24" N 72°36' 59" E	2052

Fig.1 Map showing observation stations of the study area (Malakand Division)

2.2 Methodology

2.2.1 Qualitative Data Collection

Qualitative research methods were employed to collect data on the cultural or traditional uses of turtle doves. Ethnographic approaches were utilized to engage with local communities and individuals who hold knowledge about the cultural importance of these birds. Semi-structured interviews were conducted with community members, Hunters, elders, and cultural practitioners (Smith, 2017). A total of 45 local people were interviewed belonging to different age and professions. Among the local community hunters of these birds were of special focus, as they have vast experience and knowledge of these birds. Focus group discussions were organized with community members to encourage group interactions and shared narratives (Marshall & Rossman, 2016).

2.2.2 Statistical Analysis

The ethnobotanical data was entered into Excel spreadsheets and were analyzed using quantitative indices like (a) Use value (UV) and (b) Informant consensus factor (ICF)

(a) Use Value (UV): This is a metric used in ethnomedicinal studies to quantify the relative significance of different species based on their importance among informants. It provides a quantitative measure of the cultural importance or utility of a species within a specific community. The formula for calculating Use Value, as described in the provided information, is: (Philips and Genry 1993; Muhammad et al., 2019).

$$UV = \Sigma U / N$$

Where U is the Number of use reports cited for a given plant species, and N is Total number of informants interviewed for a given species. A higher Use Value indicates that a species is more significant or culturally important within the community because it is mentioned more frequently by the informants.

(b) Informants Consensus Factor (ICF): Informant consensus factor analyzes the level of agreement between the use of a species for different categories of ailments and informants of the study area. It was calculated by using the following formula (Bhat et al., 2013; Heinrich et al., 2009).

$$ICF = \text{Nur-Nt} / \text{Nur-1}$$

Where Nur represents the Number of use citations for a particular ailments category, while Nt represents the number of species used for that ailments category. The values of ICF vary from 0 to 1. The Maximum value ICF value, which is near to 1, indicates that the informants are in favor of using species to treat particular ailments, while a low value indicates that plant species are selected randomly to treat a disease (Heinrich et al., 1998).

Data on cultural importance and use in traditional medicine was gathered from local informants (Smith, 2017). The role of turtle dove in shaping of literature, songs, and traditional stories were determined to evaluate their significance in indigenous knowledge systems. The use of Turtle dove in traditional medicine was another aspect of relationship between local communities and turtle doves (Wichai Chokwiwattana, 2017).

Status of Population was assessed through visual observations (Moreno-Zarate et al., 2020; Falcón & Hansen, 2020). Data was recorded for three consecutive days, birds were counted with the help of binocular and average number of three days count was considered as population size per day (Bibby et al., 2000; Bibby, 2004).

Historic perspective of local threats were recorded in group discussions and field observations (Bibby et al., 2000; Bibby, 2004). IUCN Red List Categories and Criteria: Version 3.2. was studied and applied to assess conservation status of the bird (IUCN, 2001).

3. Results

The turtle dove, scientifically recognized as *Streptopelia orientalis*, locally called as “Tarranga” in District Buner and “Kanra Kontara” or “Saranai Kontara” in District Swat, Dir and Shangla, was a medium-sized migratory avian species in Northern Pakistan, belonging to the Columbidae family.

3.1 Morphological Characteristics

Turtle doves typically measure around 25 to 30 cm (10 to 12 inches) in length. Adult turtle doves display a distinct plumage comprising varying shades of brown, gray, and cream. The upper parts are primarily pale brown adorned with darker streaks, while the underparts exhibit a lighter creamy hue. Notably, the neck and breast might exhibit a pinkish tint, particularly during the breeding season. Characterized by its elongated and pointed shape, the tail features a notable white border along the outer feathers, a feature observable during flight. The wings possess a brownish-Gray coloration, distinguished by a small white patch on the leading edge, which becomes more conspicuous during flight. The facial area is pale in colour, hosting a distinctive black line that extends from the bill's base to the eye, forming an identifiable eye-ring.

Sporting a compact and rounded appearance, the head displays a pale forehead and a slight crest, contributing to a raised aspect of the crown. The beak is short and slender, characteristic of birds that primarily consume seeds. It usually exhibits a dark hue. Marked by their significant size, the eyes feature a circular, dark pupil. The area encircling the eyes often showcases a light colour, accentuating the prominence of the eye-ring. Possessing relatively short legs and feet, the turtle dove's lower extremities typically display a pinkish colour. Externally, male and female turtle doves tend to appear alike, although males may slightly surpass females in size. During the breeding season, males can be identified by their gentle, purring calls utilized in the courtship process. Young turtle doves exhibit less distinct plumage compared to adults, with muted tones. They lack the pinkish hue on the breast, and the eye-ring is less pronounced. As they mature, their plumage gradually adopts characteristics resembling those of adult individuals.

3.2 Cultural Importance and Traditional Uses

The investigation into the cultural or traditional uses of turtle doves revealed a complex tapestry of significance within local communities. In-depth interviews and focus group discussions unveiled narratives, that turtle dove is always used in Pushto language as a symbol of beauty and love, for example, many cultural songs (tappy) have used the word “Taroranga” in place of beloved. Moreover, the word “Taroranga” is used for the return of spring season and a massage of good well and blessings of new year.

The findings show that Turtle doves held medicinal importance within indigenous healing practices. Local people, often custodians of ancient knowledge, use various parts of these birds in remedies aimed for treatment of specific ailments. The results show Turtle dove was used for the treatment of 7 diseases with different recipes (Table 2) The analysis of these traditional medicinal practices show a deep integration of Turtle doves in the society. As per indigenous uses reported from local communities all the ailments have scored 1 on index for Informants Consensus Factor, which is the maximum ICF score. High ICF value indicates a strong consensus, suggesting that there was a well-established traditional knowledge regarding the use of these birds for specific health issues within the community. On the same way index for Used Value (UV) indicate that Neurological disorders have scored 0.26, cold and chest infections have scored 0.2, coughing and asthma problems have scored 0.15 and the use of turtle dove as a general body tonic have scored 0.14 (Figure 2). A higher Use Value indicates that the use of turtle dove for a disease is more significant or culturally important within the community because it is mentioned more frequently by the informants.

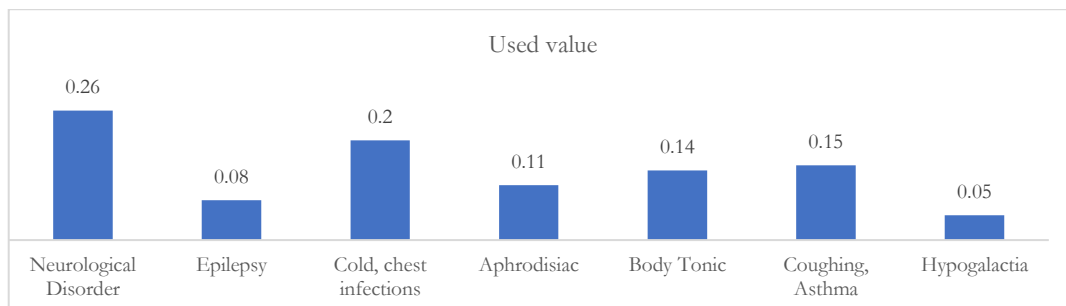


Fig.2: Different Use Value for Different Diseases.

Table 2: Different Diseases with Local Name, Use Value and Traditional Remedies.

S. No	Name of Disease	Local Name	Used value	Traditional Remedies
1	Neurological Disorder	Falaj	0.26	Meat is boiled for hours to make a thick soup and is taken orally with meal to treat neurological disorders
2	Epilepsy	Gozan	0.08	The meat is roasted on mild heat and is taken orally or boiled for hours to make a thick soup and is taken orally with meal to treat epilepsy.
3	Cold, chest Infections & Pneumonia	Pakhwala Pneumonia	0.2	It is believed that the meat of Turtle dove can treat cold and chest infections including pneumonia due to its warming effects on the body.
4	Aphrodisiac and Sexual disorder	Mardana Taqat	0.11	The meat is cooked on various ways to treat sexual disorders in male and females, also used as a sex tonic in adults.
5	Body tonic & Nutritious	Taqat	0.14	Hunter eagerly wait for the season to eat turtle flash due to its taste and nutritious value, also they consider it a rich source of proteins and take it as a body tonic.
6	Coughing & Asthmatic problems	Salandy, tokhy	0.15	The flash is eaten roasted or boiled to cure cough and asthmatic problems
7	Hypogalactia disorder	Wacha seena	0.05	The flash is eaten roasted or boiled as a galactagogue in lactating mothers to increase the milk flow

Table 2: Different diseases with local name, use value and traditional remedie

3.3 Population Status

Quantitative assessments of turtle dove populations across different study sites provided insights into their abundance. The results show a mosaic of population dynamics, revealing stable populations in late summer and low population in spring. The reason may be the period of their stayover during the journey of their migration to other parts. The findings of the study also reveal that Turtle doves prefer to stay in groups of 3 to 15 or even more, however individual birds were also observed in some cases. A stable average number of population was recorded in District Swat (227, 342) and District Buner (224, 352) in early summer and late summer, at the same time concerning declines was observed in District Shangla (117, 224) and District Dir (114, 222) (Figure 3). Importantly, this diversity in population trends hinted at localized ecological conditions, which may be their choice of habitat preference and a response to migratory pathways. As per local people the population of Turtle dove is declining year after year, which is an immediate call for intensified conservation efforts. These findings underline the relationships of Turtle dove with their ecological factors, migratory pathways, and population health.

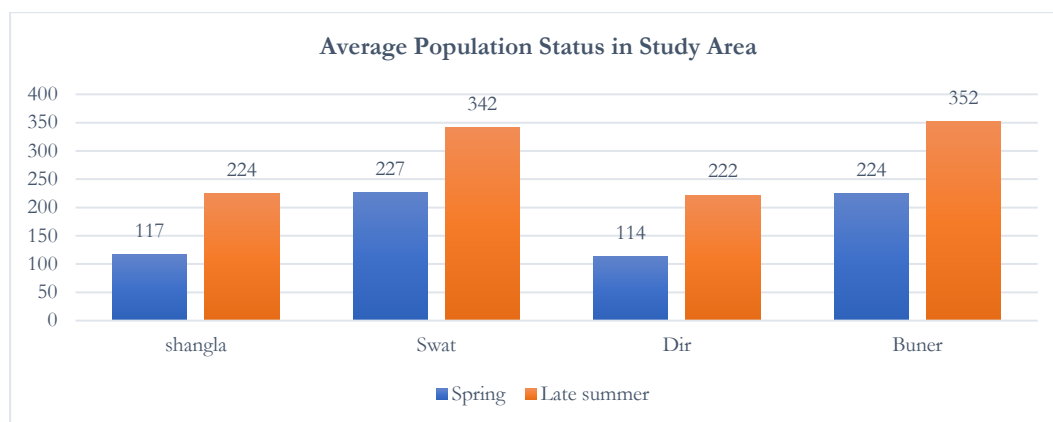


Fig.3: Recorded Average Number per Day in Different Field Stations /Observation Points.

3.4 Feeding Behaviour

Observations of feeding behaviour show that Turtle dove feed on various grains fields and weed plants. Choice of feed crop depend on availability of crop and season, results show that in early summer 60% Turtle doves prefer wheat grains, 22% feed on Brassica grains while 18% prefer open grass lands. On the other hand, Rice fields were the most favourite with 39%, followed by open grass lands with 38% in late summer and Cannabis sativa and tomato fields with 09% and 14% score respectively (Figure 4).

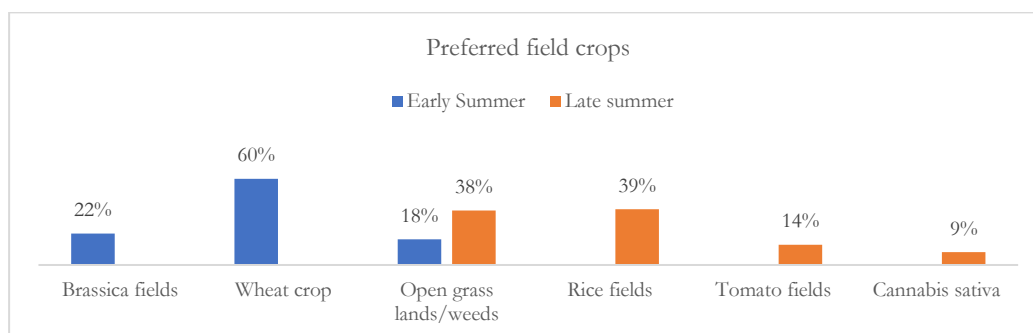


Fig. 4: Feeding Habits of Turtle Dove.

3.5 Threats

As per discussion with local people Turtle doves (*Streptopelia turtur*) are facing significant threats across their range, with their populations in significant decline over the past few decades. These threats are summarised as follows.

Habitat Loss and Degradation: Habitat loss due to monoculture forming system, urbanisation and infrastructure development has leads to habitat degradation and increasing trats to the bird. Changes in land use practices can reduce the availability of suitable foraging habitats. Turtle doves primarily feed on seeds and grains, and the loss of wildflower-rich meadows and weedy fields reduces their access to food resources. **Hunting:** Although local people understand that the population of Turtle dove is declining yet traditional hunters, hunt them regularly. Unsustainable hunting, lack of awareness and lack of law enforcement in the area is a significant threat to the population of this bird.

Climate Change: Climate change can affect the timing and location of turtle dove migrations. Changes in temperature and weather patterns can disrupt their traditional migration routes, affecting their access to critical stopover sites and breeding areas.

Pesticide Use: The use of pesticides in agriculture can lead to the contamination of the food supply of turtle doves. Ingesting pesticide-laden seeds or insects can result in direct harm to these birds.

Inadequate Conservation Measures: Insufficient awareness and conservation efforts dedicated to turtle doves can exacerbate their decline. These birds often receive less attention compared to other charismatic species.

Noise Pollution: Urban traffic noise and especially noise of gun fire by the hunters disrupt turtle dove behaviour and feeding patterns and migratory stayover.

3.6 Conservation Status

The IUCN Red List Categories and Criteria: Version 3.2 is a widely used system for classifying species according to their risk of extinction. Developed by the International Union for Conservation of Nature (IUCN), this system provides a standardized way to assess the conservation status of species based on their population size, trends, and threats they face. The Red List Categories include various classifications, such as Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild, and Extinct.

Although the status of this bird in IUCN Red list is “least concern” Followings are the arguments of our results that may categorise Turtle dove on IUCN criteria of threatened species as “Vulnerable”

Population Reduction: As per findings from the local informants the Turtle dove populations have significantly declined over the past few years (more than 30%) due to factors such as habitat loss, hunting, and climate change. This reduction in population size and distribution meet the criteria for “Vulnerable” status.

Geographic Range: Turtle doves have a relatively wide distribution (more then 20,000 Km²) but are facing threats across their range. These threats are significant and continuous, lack of conservation activities have worsen the conservation status further.

Population Size: Although the total number of mature species are unknown across their range but Results show that Population size of turtle doves is small (less then 10,000 mature

individual) and are declining rapidly, it could be classified as “Vulnerable”. Small populations are more vulnerable to various threats and have a higher risk.

Population Decline: As per local sources turtle dove population has been facing a continuous decline in the study area (more than 10 % in the past ten years or three generations), especially this decline was rapid in the past few years due to availability of sophisticated weapons and hunting devices, this indicate that Turtle dove meet the criteria for “Vulnerable” status.

4. Discussion

Turtle dove (*Streptopelia orientalis*) is a migratory bird and member of the family Columbidae possess significance cultural importance and ecological role in the study area. However, no previous study exist in the literature to determine its detail ecological role, behaviour and population status. Therefore, the current study was aimed to provide a detail understanding of the cultural significance, population dynamics, habitat preferences, migration patterns, feeding behaviour, and the operating threats in the study area.

The cultural significance of turtle doves unveils a complex relationship between these birds and the cultural heritage of local communities (Browne & Aebischer, 2004). We have find that, these avian creatures act as symbols that reflect seasonal changes, agricultural cycles, and ceremonial traditions. This association of avian species with cultural, foster the concept of ethnoornithology, a field that explores the intersection of birds and human cultures (Salmón, 2000). The findings are identical with Smith's (2017) assertion that indigenous knowledge systems often intertwine with the environment, promote cultural continuity and a sense of place. Traditional medicinal uses further enriches these complex relationship. Turtle doves not only serve as cultural symbols but also have noticeable applications in traditional medicinal practices. The results shows that Turtle dove were traditionally used for curing 7 major human ailments. This reflects the dynamic relations between culture and nature, a perspective endorsed by biocultural heritage theories (Gottlieb, 2002). These findings highlight the importance of recognizing indigenous knowledge systems and their connection to ecological resources in conservation efforts (Maffi, 2005; Gottlieb, 2002).

Many studies across the world show a continuous decline of Turtle doves due to various reasons like Gavin, 2015; Bird Life International, 2018; Dunn et al., 2018; Lormée et al., 2020; Greenlaw et al., 2023. Our results indicate that populations of Turtle dove in different observation stations was not stable and as per local sources the population is declining year after year. The varying population dynamics of turtle doves across different study sites provide valuable insights into the conservation status of these birds. The fluctuations observed align with concerns raised by Moreno-Zarate et al., (2020) regarding the decline of turtle dove populations across their range. The results negate the claim of IUCN, (2016) that Turtle dove (*Streptopelia orientalis*) has stable population across their ranges. Based on the current results Turtle dove (*Streptopelia orientalis*) was assigned the category of “Vulnerable” species when evaluated on IUCN Red List Categories and Criteria: Version 3.2. (2001). The results strengthen the idea that effective conservation strategies must be goal-specific in the context of local conditions (Holling & Walters, 1978). This principle of goal-specific management focus on the need for flexibility and changes in decision-making, particularly in light of ecological and anthropogenic challenges. The dynamics in population trends also underscore the significance of flyways, stopover sites and habitat preference during their migration journey (Bauer et al., 2016). Therefore, national and international collaborations become crucial to

ensure the long term conservations of these migratory birds across different countries and regions (Bird Life International, 2018).

The study's results suggest that these birds are not only integral to ecosystem health but also contribute to the availability of culturally significant plants. Habitat loss and degradation represent one of the most prominent threats to turtle doves (Sauser et al., 2022). This threat takes various forms. Agricultural expansion, driven by the intensification of farming practices, often results in the conversion of diverse, open landscapes preferred by turtle doves into monoculture fields. This transformation reduces the availability of suitable feeding areas for these birds. Moreover, rapid urbanization encroaches upon turtle dove habitats. The development of infrastructure, roads, and buildings disrupts feeding areas, contributing to habitat fragmentation. Additionally, alterations in land use patterns, including the transformation of traditional farming practices, lead to the loss of vital habitats that once supported robust turtle dove populations (Hanane, 2016). This revelation elevates habitat management to a new level of significance, where conservation efforts extend beyond the preservation of biodiversity to incorporate the protection of forest resources (Maffi, 2005). This integrated approach reflect the concept of habitat conservation, which focus on the coexistence of species conservation and ecological sustainability.

Unregulated hunting and trapping pose a significant threat to turtle doves in the study. These birds are often hunted for sport, traditional used, or, source of food. The scale of unsustainable hunting, particularly during migration when these birds are vulnerable, can lead to severe consequences on local populations (Sauser et al., 2022). Climate change have additional complications faced by turtle doves. Climate change have altered migration patterns, attributed to shifts in temperature and weather patterns, thus can disrupt the timing and location of turtle dove migrations. These changes affect their access to critical stopover sites and breeding areas, potentially impacting their ability to successfully complete their long-distance journeys (Bauer et al., 2016; Browne & Aebischer, 2004). The extensive use of pesticides in agriculture poses a significant risk to turtle doves. Pesticides can contaminate water sources and the food supply of these birds. Ingesting pesticide-laden seeds or insects can lead to direct harm and population declines (Boatman et al., 2004). Insufficient conservation awareness and efforts dedicated to Turtle doves can worsen their decline. These birds often receive less attention compared to other native birds of the study area, insufficient resource allocation and initiatives lead toward poor conservation (Cooke et al., 2024). Modern farming methods can have unintentional consequences on Turtle dove populations. Practices such as early harvesting and the use of herbicides can reduce the availability of seeds and grains that turtle doves rely upon for sustenance (Browne et al., 2003). During their extensive migrations, turtle doves face numerous threats. These include habitat degradation at stopover sites, illegal hunting along migration routes, and climate change (Eraud et al., 2016). Resource competition with other bird species can pose a threat to turtle doves, particularly when food resources are limited. Competition with other species may reduce their access to critical food sources (Boatman et al., 2004). Urban and industrial noise and fire of guns can disrupt turtle dove behaviour in their feeding grounds. These disturbances can interfere with various aspects of their lives, including breeding, feeding behaviour and migration pattern (Cooke et al., 2024).

5. Conclusion

Detail investigation of the current research work has determined cultural & ecological importance, life habits and population status of turtle doves (*Streptopelia turtur*) in Malakand Divioson of Northern Pakistan.

Our findings regarding the cultural importance of Turtle doves emphasize their role as cultural symbols that bridge the gap between the human experiences and the rhythms of nature. These birds serve as living indicators of changing seasons, agricultural cycles, and ceremonial traditions, language and traditional songs show deep relations between nature and culture. Furthermore, the identification of traditional medicinal uses shows that were being used to cure 7 human ailments which underscores the relation of human cultural heritage and biological resources. Such interactions emphasize on measures to preserve indigenous knowledge systems that have evolved over generations. By recognizing the interdependence of ecological health and cultural values, conservation strategies can bridge the gap between conservation science and indigenous knowledge. The temporal correspondences underscore the need to engage cultural practitioners and communities in conservation dialogues.

Choice of feed crop depend on availability of crop and season, results show that in early summer 60% Turtle doves prefer wheat grains and on the other hand, Rice fields were the most favourite with 39%, followed by open grass lands with 38% in late summer. The population study of Turtle doves bring into focus the challenges of conservation in a rapidly changing world. The fluctuations observed population size underscore the vulnerability of these birds to diverse ecological and anthropogenic pressures. As per local people the population of the turtle dove is declining year after year and the recorded number were less the 10,000 Also they were facing ecological challenges and life threat like habitat degradation and continuous unsustainable hunting, These challenges determine their category of conservation status to be “Vulnerable” species. The study negate the idea of IUCN (2016), where they clam turtle dove as a “Least Concern” species. The goal of sustainable conservation approach undertaken by national and international organizations in the long term has been recommended to save the bird. We recommend that, Biocultural Conservation Initiatives can be undertaken that weave together ecological and cultural knowledge. These initiatives can empower local communities, fostering a sense of ownership and stewardship. Collaborative efforts along migratory routes can strengthen the impact of conservation actions and contribute to the preservation of these birds across their geographic range. The government should implement land use planning to protect the natural habitat of Turtle dove and other wildlife resources of the study area. Awareness campaigns can play a pivotal role in fostering appreciation for the cultural and ecological significance of turtle doves, along with strictly implant ban on hunting and pouching of these birds.

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