



Anthropogenic Impacts on The Conservation of Grey Crowned Crane *Balearica Regulorum* at Lake Ol' Bolossat, Kenya

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Abstract

Human population growth and related land-use changes are a significant threat to biodiversity, particularly due to habitat fragmentation, degradation, and loss. Birds are vulnerable species because their habitats are being converted to support human activities. The Grey Crowned Crane, an endangered bird listed in the IUCN list of Endangered Species, is a flagship and umbrella species endemic to Africa, facing a sharp decline in its global population. The current estimated population ranges between 26,500 and 33,500 birds globally, 8500-10000 in Kenya and 1,100 birds recorded at Lake Ol' Bolossat in Kenya. Despite their coexistence with humans in shared landscapes, little is known about the impact of their interactions with human activities. To understand the impact of this interaction, a questionnaire with closed-ended questions was used to collect data on community perceptions on Crowned Crane conservation from 95 respondents across 11 Villages around the Lake. Sampled households were located 0-3Km from the Lake boundaries. Data was analyzed using descriptive statistics, Chi-square tests of independence, and Fisher's Exact Test when expected cell counts were few. Statistical significance was evaluated at $\alpha = 0.05$. All demographic factors did not have a significant effect on Crowned Crane conservation except for hunting, which varied significantly across the 11 villages ($\chi^2(10) = 37.13$, $p < 0.001$). Whilst the respondents were conversant with the crowned crane, it did not result in successful conservation efforts, as localized pressure was evidenced by hunting. Promoting programs and strategies that foster community awareness on the importance of conservation, while supporting community-based crane conservation initiatives, is recommended. These may include outreach activities in local schools, community meetings (chiefs' and sub-chiefs' barazas), as well as community-tailored conferences and workshops on conservation.

Keywords: Grey Crowned Cranes, conservation, human-wildlife interactions, Lake Ol' Bolossat.

Introduction

Human population growth and consumption patterns have significantly contributed to the decline of biodiversity on Earth (Prakash & Verma, 2022). Human appropriation of land for settlement, agricultural expansion, and urban development is one of the major activities affecting 85% of the species indicated in the IUCN Red List of Threatened Species, primarily through habitat fragmentation and habitat loss (Pimm et al., 2014). In agricultural landscapes, the coexistence between people and birds is significant, as farmlands often serve as vital feeding grounds and breeding places for many bird species (Bhattarai et al., 2025). Nonetheless, this coexistence is increasingly challenged by the swift rise in the human population, which fuels land conversion and habitat destruction. It is estimated that 53% of the Earth's landscapes have been reshaped for human use globally (Chen et al., 2019), with such changes introducing multiple threats to bird populations, including the loss of nesting habitats, hunting, and egg collection (Gosai et al., 2016).

Globally, the Grey Crowned Crane, hereafter referred to "Crowned Crane" is endemic to Sub-Saharan Africa, often inhabiting wetlands and savannahs. Their range extends from the eastern Democratic Republic of Congo, Kenya, Uganda, and South Sudan in Eastern Africa, southward to the southeastern parts of South Africa in southern Africa (Morisson et al., 2019; BirdLife International, 2024). The Crowned Crane is a flagship and umbrella species, playing a vital role in the conservation of wetland and grassland ecosystems worldwide, as their habitat needs support for broader ecological health (Nowald et al., 2018; Beilfuss et al., 2018).

The Crowned Cranes have exhibited a declining trend in their population (BirdLife International, 2024) across all their natural habitats, with an estimated global population of between 26,500 and 33,500 (Morrison, 2015), 8500-10000 nationwide, and 1,100 individuals at Lake Ol' Bolossat (hereafter referred to as Lake), Kenya (Wamiti et

al., 2020). Moreover, the Lake is one of the six regions with acceptable populations of Crowned Cranes (Wamiti et al., 2020) in Kenya.

The global decline of the Crowned Cranes is a key concern, especially since most of their population exists outside protected areas (Wamiti et al., 2020) and interacts with humans across various habitats. However, there is little understanding of this interaction, particularly because it involves crop damage and land use change (Morison, 2015). This study was conducted to assess the impacts of human activities on Crowned Cranes in and around the Lake, which is crucial for developing effective Crowned Crane conservation strategies across their habitats.

The decline of the Crowned Cranes is one of the main issues globally, particularly as the majority of the species is located outside the reserves (Wamiti et al., 2020) and interacts with people in different environments. Nevertheless, this interaction is hardly understood, especially since crop damage and land use change are involved (Morison, 2015). This research was carried out to determine the effects of human activities on the Crowned Cranes within and around the Lake so that proper strategies for conserving the Crowned Cranes in the different areas could be developed.

Methodology

Lake Ol' Bolossat, which lies at 0° 09'S latitude and 36° 26'E longitude, is located in Nyandarua County in the central highlands of Kenya; approximately 195 km North of Nairobi. It borders Laikipia West to the north, Ndaragwa to the East and South, and Ol' Kalou and Ol Joro Orok to the West (figure 1). The lake has a surface area of 43.3 sq. and lies at an altitude of 2340m above sea level, positioned between the Dundori Ridge and the northwestern slopes of Aberdare Mountains. It serves as the source of the Ewaso Nyiro River, which leaves the basin as Ewaso Narok River through Thomson's Falls (East African Wildlife Society, 2022).

The Lake is a recognized IBA (Important Bird/Biodiversity Area) that hosts numerous hippopotamus families and contains significant waterfowl species, besides serving as a vital stopover and wintering ground for migrant bird species (Wamiti et al., 2009). It is an important habitat for a Kenyan endemic bird species like the Sharpe's Longclaw (*Macronyx sharpei*) an endangered bird species, alongside the Jackson's Widowbird (*Euplectes jacksoni*), a near-threatened species that has a restricted range in East Africa and supports a high diversity of plant species (East African Wildlife Society, 2022).

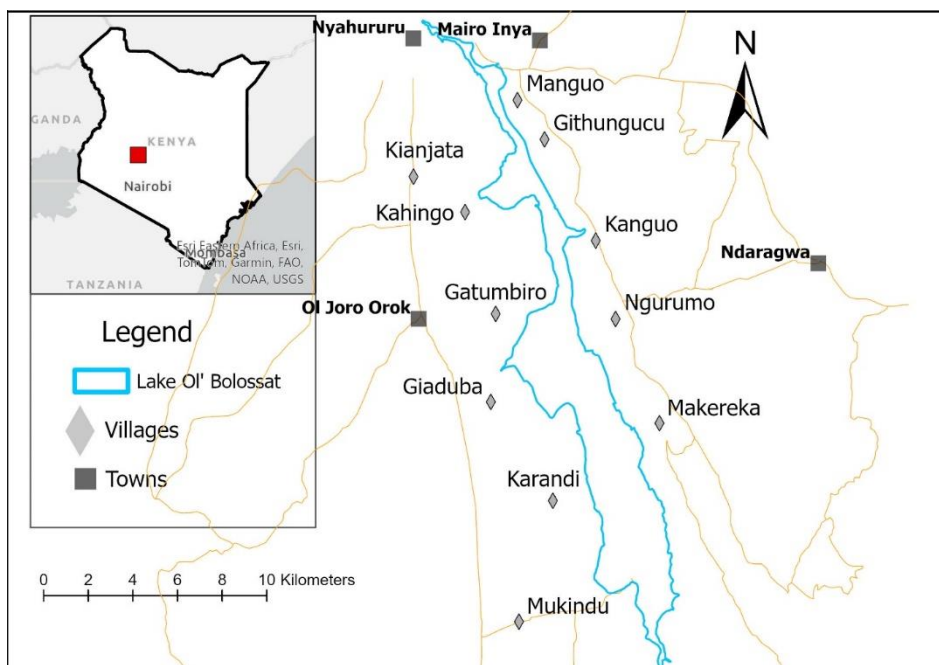


Figure 1. Map showing the study area

113 households, across 11 villages located 0-3Km from the lake boundaries, were systematically selected, where every 5th homestead on either side of human pathways and roads was sampled, and a questionnaire with closed-



ended questions was used to gather information about community opinions on the Crowned Crane conservation around the Lake.

Results and Discussion

Results

Out of the 113 questionnaires, a total of 95 questionnaires were fit for analysis (Table 1). According to the results, 50.5% of the respondents were male, while 49.5% were female (Table 2). 2.1% of respondents were aged below 20 years, 51.6% were aged between 20-40 years, 40% were aged between 41-50 years, while 6% were aged above 50 years (Table 2). Most respondents had a secondary school education, while 32.6% had completed primary school, 11.6% had attained tertiary education, and 9.5% had no formal education (Table 2). Farming was the main economic activity in this area, with 74.7% of the respondents engaged in it. Other occupations included entrepreneurs (9.5%), students (4.2%), and fishermen (3.2%) (Table 2).

TABLE 1: Distribution of respondents in sampled villages

Villages	Frequency	Percent
Githungucu	10	10.5
Kianjata	7	7.4
Kahingo	8	8.4
Kanguo	7	7.4
Manguo	6	6.3
Ngurumo	10	10.5
Makereka	6	6.3
Mukindu	7	7.4
Gatumbiro	11	11.6
Giaduba	11	11.6
Karandi	12	12.6
Total	95	100.0

TABLE 2: Social Demographic Characteristics of Respondents

Characteristic	Category	Frequency	Percent
Gender	Male	48	50.5%
	Female	47	49.5%
Age (in years)	Below 20	2	2.1%
	Between 20 and 40	49	51.6%
	Between 41 and 50	38	40.0%
	Above 50	6	6.3%
Education Level	Indigenous	9	9.5%
	Primary	31	32.6%
	Secondary	43	45.3%
	Tertiary	11	11.6%
Occupation	Farmer	71	74.7%
	Civil servant	7	7.4%
	Student	4	4.2%
	Entrepreneur	9	9.5%
	Fisherman	3	3.2%

Community Attitude Towards Crowned Crane Conservation



Among the respondents interviewed, 96.8% were familiar with the Crowned Crane, while 3.2% were not. The proportion of respondents who were aware that the crane is facing a risk of extinction was only 30.5% whereas 69.5% did not. A Fisher's Exact Test was conducted to examine the relationship between respondents' distance from the lake, gender, and age group, and their awareness of the Crowned Crane. The results of the test indicated that the awareness of the Crowned Crane is not significantly influenced by the proximity to the lake ($p = 0.73$), nor does it vary significantly between genders ($p = 0.24$) or age groups ($p = 0.43$) in the current sample. The test was further used to evaluate whether demographic factors (gender, distance from the lake, and age group) were linked to respondents' knowledge of the Crowned Cranes' conservation status. None of the associations were found to have any statistical significance, gender ($p = 1.00$), distance ($p = 0.91$), nor age group ($p = 0.94$). These findings suggest that these demographic factors do not influence the perceptions of the status of the Crowned Crane in this sample.

There is no cultural significance associated with the Crowned Crane among the community residing around the Lake, as reported by 92.6% of the respondents. Fortunately, many acknowledged the species' economic worth, pointing to its contribution to the ecological cycle, as a biological pest control and for landscape attractiveness. Some of the respondents were, however, opposed to the Crowned Crane conservation and viewed the bird as a nuisance crop pest. The vast majority of the respondents (97.9%) agreed there were no laws prohibiting the killing of Crowned Crane, whilst 44.2% acknowledged that hunting was practiced in the area with 40% citing hunting for food as the main motivation behind Crowned Crane hunting, 4.2% doing it for sale whilst the rest were indifference as to why Crowned Crane were being hunted. Despite the prevalence of chicken as the dominant source of poultry meat in the region, 12.6% of respondents expressed a preference for crane consumption.

To determine if distance from the lake had a close association with Crowned Crane hunting, the Pearson's Chi-square test was performed. The results indicated a non-statistically significant association between the two variables ($\chi^2(2) = 1.05$, $p = 0.592$). This implied that respondents' proximity to the lake did not correlate with the probability of Crowned Crane hunting among the respondents in this sample. Further analysis revealed no significant difference in respondents' perceptions of the economic importance of the Crowned Crane across the surveyed locations ($\chi^2(50) = 59.07$, $p = 0.178$). Additionally, respondents perceived the economic value of the Crowned Crane had no significant relationship to reported hunting behavior ($\chi^2(5) = 0.58$, $p = 0.989$). However, the respondents' location showed a statistically significant relationship with reported hunting of the Crowned Crane ($\chi^2(10) = 37.13$, $p < 0.001$), implying that hunting behavior had a significant variation across the 11 villages. This variation indicates that certain villages were contributing more to hunting pressure on the crowned crane population than other villages, a trait that best explained observed declines in Crane numbers and lay emphasis on the fact that observed hunting behavior among the respondents stems beyond their perceived perceptions on GCC economic value, cultural beliefs and distance from the Lake and can be explained by factors beyond the respondents' behaviors.

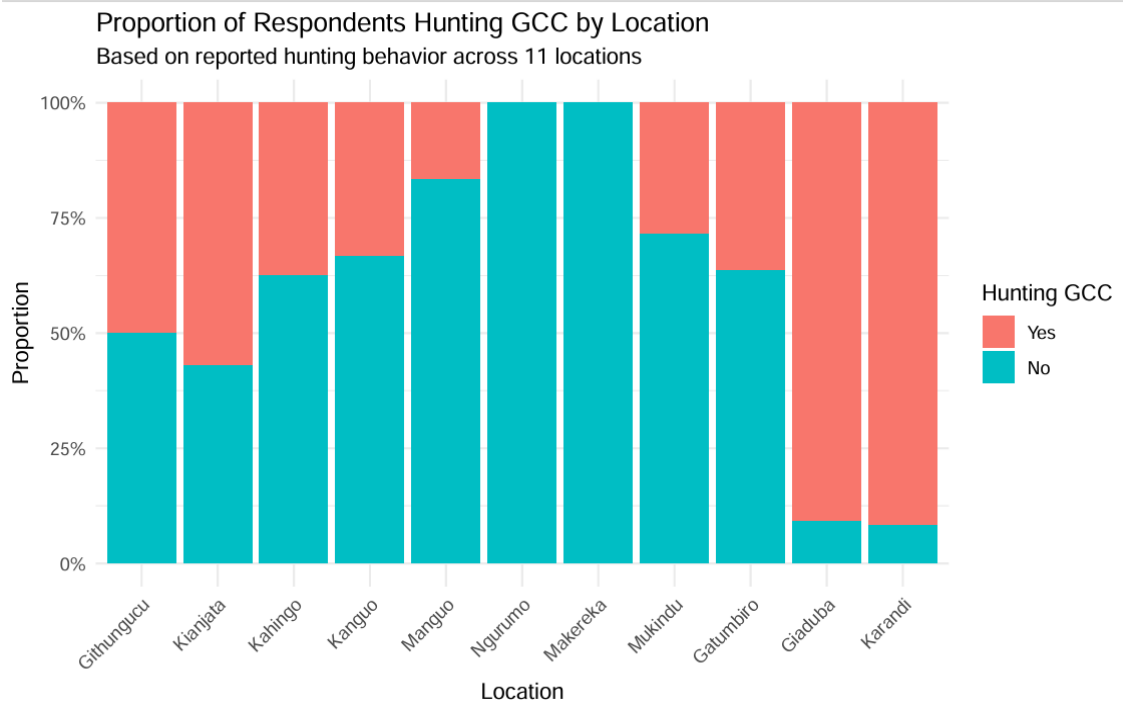


FIGURE 2. Proportion of Crowned Crane hunting across the 11 villages.

Habitat Utilization by the Local People

The habitat around the Lake is mainly used for agriculture, according to 97.9% of the respondents who are involved in small-scale farming. 63.2% utilize the lake as a watering point for their livestock (cattle and sheep), 28.4% use it for fishing, 6.3% for irrigation, and 2.1% use the lake for recreation.

The sizes of land owned range from none to 10.117ha, which is mostly used for small-scale farming, with 71.6% of the respondents envisioning continuing farming in the future. Respondents showed less frequency in visiting the lake, with 17.9% visiting the Kichakani area, which is the main entrance to the lake, while the Githung'ucu area reported the lowest visits. 47.4% of the visits to the lake are used for leisure walks, while 14.7% visit all the areas of graze and water livestock.

Historical and Current Distribution of the Crowned Crane

80% of the respondents were aware of the change in Crane distribution in the area out of which 65.3% reported a decline in the Crane numbers and associated it to migration to other areas, poisoning, food shortage due to reduction of foraging areas, egg collection, climate change, chemical effluents from flower farms and in adequate conservation measures while the remaining 14.7% of the respondents reported an increase in the Crane numbers attributing it to plenty of food in the farmlands. 11.6% of the respondents were unsure of the change and linked it to the prevailing season, while 7.4% of respondents had no answer to the question.

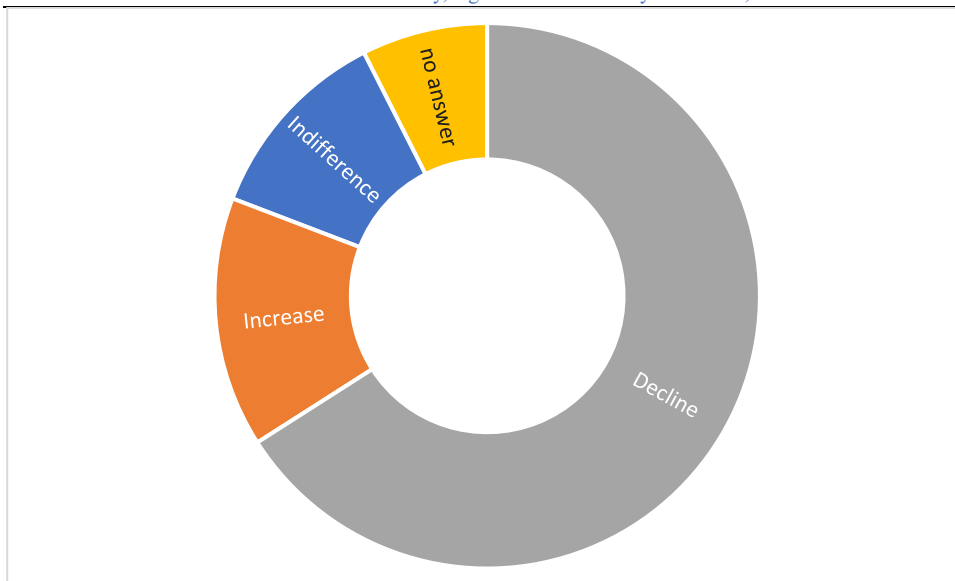


Figure 3. Respondents' Views On Crowned Crane Population Changes At Lake Ol' Bolossat.

Recommendations to Enhance the Conservation of the Crowned Crane

Respondents suggested several measures to enhance the conservation of the Crowned Crane. These included prohibiting hunting (8.4%), using scarecrows on farms to deter cranes (2.1%), prohibiting grazing within the lake's vicinity to prevent habitat degradation (2.1%), regulating access to the lake through gazettement (2.1%), engaging communities in crane protection (7.4%), devising strategies to prevent cranes from foraging on farmland, and creating awareness on crane conservation (2.1%).”

Discussion

The community around the Lake was well-versed with Crowned Crane bird, but only a few respondents acknowledged being aware of its conservation status. A phenomenon best explained by the existence of a knowledge gap among communities, as conservation efforts are often concentrated within protected areas, with limited outreach done to communities that coexist with wildlife outside the protected areas (Katuwal et al., 2024). As predicted, statistical tests found no significant association between the demographic variables and respondents' awareness of the Crowned Crane and its conservation status around the Lake. This outcome implies that the Crowned Crane's knowledge and recognition of its conservation status are consistently shared across social groups, rather than being shaped by individual characteristics or proximity to the Lake. Similar findings were observed by Bhattarai et al. (2025) among Sarus Cranes; they attributed the positive community attitude to the cranes' physical attractiveness, vocalizations, and courtship dance, as well as their cultural and religious significance in Buddhist and Hindu cultures. According to Katuwal et al. (2024), demographic characteristics play a critical role in shaping community knowledge and perceptions of conservation. However, this is not always consistent. In line with our findings, Bhattarai et al. (2025) found no significant relationship between socio-demographic factors and perceptions of distribution, nesting, and population trends of Sarus Cranes in Nepal.

The analysis revealed a statistically significant variation in hunting across the 11 surveyed villages. It was the only significant anthropogenic threat to Crowned Crane conservation around the Lake. This suggests that while the community interacts with Crowned Crane habitats in multiple ways, demographic characteristics alone do not directly predict conservation behavior or attitudes toward Crowned Crane. This emphasizes that localized conservation pressure exists, especially during the breeding season, and this goes beyond individual knowledge on conservation. This aligns with findings by Wanjala et al. (2024) and Owiti et al. (2024) who concluded that awareness alone does not necessarily translate into successful conservation outcomes, unless coupled with community engagement, conservation incentives, or government enforcement.

Hunting through the live trapping of the Crowned Crane for food was cited as a major threat to Crane conservation, with our findings aligning with those of Gichuki (1994), who found that 15% of crane mortality in western Kenya



resulted from hunting for food. Consistent with Gameda et al. (2016) findings on Black Crowned crane conservation in Ethiopia, our findings indicated minimal human–crane conflict around the Lake. In line with Gameda et al. (2016) study on Black Crowned crane conservation in Ethiopia, there was minimal human-crane conflict around the Lake which was mostly manifested in crop damage by Crowned Crane, mainly on peas, maize, and wheat. This is, however, not outrageous as (Olupot et al., 2010) found crop damage to be a major form of crane conflict in Uganda. This reinforces the assertion that non-demographic, behavioral threats are more accountable for driving crane conservation threats than awareness or knowledge tied to socioeconomic background.

Conclusion and Recommendations

The Crowned Crane was a familiar bird to community members, although most were unaware of its conservation status. Dependence on agriculture among most respondents indicated a high likelihood of increased habitat conversion to farmland, leading to habitat loss and more human-crane conflicts, which in turn foster negative attitudes toward Crowned Crane conservation. Hunting of the Crane was a major threat to their protection, and this was worsened by the lack of cultural significance attached to it among community members around the Lake. Promoting programs that foster community awareness on the importance of crane conservation, while supporting community-based crane conservation initiatives, is key to onboarding the community members to support crane conservation. These may include outreach activities in local schools, community meetings (chiefs' and sub-chiefs' barazas), as well as community-tailored conferences and workshops on conservation.

Similar studies are recommended in other wetlands in Kenya where Crowned cranes are found in sizeable populations. This will inform community engagements in the conservation of cranes.

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