REVIEW ARTICLE

A review of the distribution, nutritional value and conservation status of wild harlequin quails (*Coturnix delegorguei delegorguei*) in Kenya

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ABSTRACT
Wild harlequin quails are a traditional source of protein in many parts of Sub-Saharan Africa. Nonetheless, they are greatly underutilized to combat malnutrition and ensure food security. The current status of quail populations in Kenya is mostly unknown, especially after introducing numerous exotic quails during the quail 'bubble' of years 2013-2015. Besides, the ongoing uncontrolled harvesting of wild harlequin quails and its effect on wild quail populations has not been examined either. The aim of this review is to discuss and reveal the emerging issues associated with the opportunities, utilization challenges and conservation status of wild harlequin quails in Kenya. This review will focus on peer-reviewed research articles, published books, review articles and internet resources on wild quails and commercial quail farming. It is essential to point out that quails are already considered as emerging poultry, and increased consumption of their products is highly encouraged, thus contributing to food security in Kenya. However, wild harlequin quail conservation concerns need to be addressed regarding their uncontrolled harvesting, destruction of their habitats, and climate change.

Keywords: Emerging livestock species, Japanese quail, food security, genetic diversity, poultry

1.0 Introduction

Quails are known to be indigenous to Africa. Some of the wild species, such as the African harlequin quail (*Coturnix delegorguei delegorguei*), common quail (*Coturnix erlangeri*), African blue quail (*Coturnix adansonii*) and rain quail (*Coturnix coromandelica*) have all been observed in Kenya (Zimmerman *et al*., 1996). However, the most common domesticated species is the Japanese quail (*Coturnix japonica*), which originated from Asia (Nishibori *et al*., 2001).

Food security improvement and addressing world issues relating to malnutrition have encouraged the Food and Agriculture Organization of the United Nations to emphasize the identification of alternative food resources (Jeke *et al*., 2018). Quails, especially in developing countries, are complementary poultry to chicken, thereby contributing to food security. They also provide an extra source of income and have become popular among

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small-scale farmers. Rural subsistence farmers from different parts of the country, especially Western Kenya, have also been harvesting wild quails (Wamuyu *et al*., 2017). These wild quails are found seasonally and typically breed in grasslands terrains and farmlands where they are mostly captured.

The introduction of exotic quail breeds into the country has mainly been facilitated by the government of Kenya, national agricultural research systems (NARS), and large-scale farmers. However, following the recent quail 'bubble' that happened between 2013-2015, (Craze for quail farming, 2014), there was a sudden increase in the number of quails introduced into the country. This increase resulted from the speculated nutritional and therapeutic benefits of quail meat and eggs. Currently, the status of exotic quails in the country and the possible effects of their introduction to the genetic pool is unknown. Therefore, assessments are required to review the current conservation status of wild harlequin quails and the impacts of increased commercial quail farming in Kenya.

2.0 Wild quail distribution and harvesting

Wild quails are extant in several East African countries like Kenya, Tanzania, Uganda, Rwanda, and Burundi (Zimmerman *et al*., 1996). In Kenya, wild quails have been identified in many parts of the country such as Siaya, Kisumu, Vihiga, Homabay, Kakamega, Busia, Bungoma, Trans Nzoia, West Pokot, Samburu, Turkana, Kiambu, Kajiado, Makueni, Kitui, Tana River, Kilifi, and Lamu counties. However, wild quail harvesting is more practiced in some key areas than others. These include Siaya, Kisumu, Vihiga, Busia, and Homabay. Wild harlequin quails are common in Siaya and rural parts of Kisumu, while the common quail is mainly harvested in Vihiga and some parts of Busia. On the other hand, the African blue quail are hunted and consumed in Homa Bay. Hunting of wild quails for consumption has been practiced as a custom in Western Kenya for a long time.

Rural farmers in the Western region have been harvesting wild harlequin quails using traditional methods (Wamuyu *et al*., 2017). In these areas, wild harlequin quails are mainly hunted for meat, but none are kept for egg production since the captive females hardly lay eggs despite numerous efforts by the farmers. We also noted that more males are typically captured than females adding to the list of growing concerns (Ogada *et al*., 2021). Wild harlequin quails are found seasonally and commonly breed in grasslands terrains and farmlands where they are mostly captured. Even though wild harlequin quails are listed as a species of Less Concern (LC) due to their extensive range over several countries (Mace and Lande, 1991), there has been growing concern over the long-term effects of their harvesting (Wamuyu *et al*., 2017).

3.0 Economic gains and nutritional benefits of quail meat and eggs

Quails are hardy and can survive in unfavorable climatic conditions with little maintenance costs. This attribute makes them favorable to small-scale farmers with limited resources. Most rural small-scale farmers often capture wild harlequin quails for a short period before selling them. During this time, they are usually on a diet of small grains such as millet. They are also provided with water. Farm-reared quails, in contrast, are often on special

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commercial diets to encourage their growth for meat and egg production. However, this option is more affordable than larger poultry species, such as chicken.

There has been a growing demand for quail meat and eggs over time. However, the sudden demand in Kenya, which peaked in 2013 to 2015, was mainly fueled by the speculation that quail meat and eggs contained vital minerals and medicinal properties (Craze for quail farming, 2014). This craze led to a sudden influx of exotic quail species and increased harvesting of wild quails in the country, which were both influenced by that demand (Chepkemoi *et al*., 2017). Consumer preferences have also continued to change over time due to the current demand for healthier foods, implying that meat and eggs that contain less fat but more minerals that are vital to the body (Bett *et al*., 2012). According to findings by Chepkemoi *et al*. (2017), wild harlequin quail meat had the highest protein content (25.50%) compared to domestic quail, guinea fowl, indigenous and commercial chickens. Wild harlequin quail meat also had the least saturated fatty acids (24.86%) and the highest polyunsaturated fatty acids (74.85%). Higher amounts of minerals, such as zinc, potassium, calcium, and iron, were also detected. This information helped to demystify some of the beliefs about quail products by actually confirming that quail meat, especially from wild harlequin quails, had better properties compared to other poultry. On the other hand, Japanese quail eggs, were also found to comprise favorable protein proportions suitable for the human diet and could significantly contribute to improved nutrition (Jeke *et al*., 2018). We also noted that wild quail farmers preferred meat and eggs from wild harlequin quail compared to exotic breeds stating that they are a healthier option and have better taste. Commercial Japanese quail produce more eggs and weigh more, making them be preferred by farmers who are into the business mainly for profit. Such findings did not exist at the time; therefore, individuals relied on instant misguided results within weeks of consumption of quail products.

4.0 Threats

Through its agencies (NARS), the government of Kenya has mainly facilitated the introduction of exotic quail breeds such as the Japanese, Bobwhite, and English White quails into the country (Chege, 2014). However, following the recent quail 'bubble,' there has been an increase in the number of different commercial quail species introduced from multiple unknown sources (Ogada *et al*., 2021). These exotic breeds are often imported from Asia and Europe and are usually products of generations of artificial genetic selection for improved meat and egg production. The status of exotic quails in the country and the possible effects of their introduction to the genetic pool is unknown. The possibility that Kenyan farmers might interbreed the introduced exotic species such as the Japanese quail with local wild quail populations to improve production could be of concern.

Besides, the incessant hunting of wild African quails may lead to their declining numbers in the wild and possible extinction (Puigcerver *et al*., 2014). In Europe, uncontrolled hunting of wild common quails led to their declining numbers; after which, governments and non-governmental wildlife conservation agencies began restocking (Laikre *et al*., 2010). However, this led to adverse genetic changes, such as loss of genetic variation and altered population

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structures (Sanchez-Donoso *et al*., 2012). In some parts of Western Kenya, wild quails are also subjected to domestication efforts by some local farmers. Such activities interfere with their ecological behavior, especially when in captivity over a long period (J. Okello, personal communication, November 18, 2020). The re-introduction of these captured quails that were formerly wild, back into the wild population also adds to the list of concerns. The genetic effects of such actions are largely unknown at the moment since there is no molecular information available on wild harlequin quails.

Wild quail populations are constantly under threat from climate change and the destruction of their habitats through human activities (Ogada *et al*., 2021). The rise in temperatures, declining rainfall, and human population growth have not only contributed to the decline in wild quail populations but also other plant and wildlife species (Ogutu *et al*., 2016). The population rise has influenced the destruction of habitats, and the increased demand for food as forests, shrubs, and grasslands are continually destroyed to create farmlands. These farmlands, especially millet and sorghum farms, provide food to wild quails resulting in human-wildlife conflicts.

5.0 Conservation status and strategies

Government policies that encourage privatization, subdivision, and cultivation of land have been at the forefront of habitat fragmentation, degradation, and loss (Ogutu *et al*., 2016). Therefore, institutions and farmers should implement measures that discourage habitat destruction, especially in areas with known wild harlequin quail populations. This approach will help prevent encroachment into protected lands and uncontrolled harvesting of wild harlequin quails and other species such as guinea fowls. In conjunction with County Governments, some of the National Conservation agencies in Kenya, such as the Kenya Wildlife Service and National Museums of Kenya, have also organized wildlife awareness campaigns to educate the public on proper conservation methods. Currently, some of the most effective and successful wildlife conservation methods applied worldwide have relied on the help of local communities, which has led to the development of community wildlife conservancies (Isiugo and Obioha, 2017). Regions with large magnitudes of land under wildlife conservation were found to have a higher population density of wildlife (Ogutu *et al*., 2016). Very few Counties in Western Kenya have wildlife conservancies, and this could explain the reduction in wild harlequin quail population numbers over the years.

Molecular studies through the use of genetic markers and tools such as mitochondrial DNA, microsatellites, and genome-wide scans have proven useful when studying and monitoring the genetic diversity of a population. In areas with suspected hybridization of exotic quails with local wild harlequin quail species, molecular studies are usually the best form of assessment. Surveys and assessments are required to review the current status of quail farming in Kenya concerning the introduction of exotic quails and their possible interaction with all wild quail species. Information from such studies can be used to develop conservation strategies to preserve the genetic integrity of Kenya's wild harlequin quail populations.

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6.0 Prospects

Climate change and human population rise have encouraged us to seek alternative food sources, especially in developing countries of Africa, where food insecurity is still a concern (Sasson, 2012). Indigenous chicken farming alone, which is the most common source of animal protein in rural areas of developing countries, has not been able to meet population demand. Quails have the potential to help fill that protein deficiency gap since they are relatively cheap. The introduction of quails as a complementary avian protein source in India over the last two decades has led to the decline of protein deficiency in its population (Arya *et al*., 2018). Adopting such a strategy incorporating both commercial and wild quails could be a solution to alleviating protein deficiency in Kenya. However, this endeavor should be conducted with proper planning taking into consideration the current conservation status of wild harlequin quails. Unlike the Japanese quail, whose domestication occurred in the late 19th century and is currently consumed worldwide (Lukanov, 2019), little effort has been made concerning the breeding of wild harlequin quails to prevent uncontrolled harvesting from the wild. Even with some unconventional attempts by some local rural farmers, the government of Kenya national agricultural institutions have not made any serious efforts.

7.0 Conclusion

The economic and nutritional benefits of wild harlequin quails are now known; thus, the Kenyan government and relevant stakeholders should take steps to develop a breeding program that would ensure conservation by sustainable use. This approach is against the backdrop, where wild harlequin quails are already being consumed as a cheap source of nutritious protein and income. This step could help increase production and manage the threat of uncontrolled hunting by rural farmers. Adoption of proper land-use policies and community education on wildlife conservation are additional steps that can be implemented to improve further the conservation strategies that are lacking. Genomic studies that can establish the genetic background of wild harlequin quails are central. Information on diversity and the effective population size changes of wild harlequin quails over time can be determined from population genetic analyses. Such information will be helpful in monitoring and utilization of its genetic resources.

8.0 References

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