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Review

GEOMETRIC INCREASE IN ANTHROPOGENIC ACTIVITIES: PROSPECT OF AFRICAN GREY PARROT *PSITTACUS ERITHACUS* AND LOVEBIRD *AGAPORNIS PULLARIA* IN RIPARIAN GUINEA SAVANNAH

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Abstract

African grey parrot Psittacus erithacus and lovebird Agapornis pullaria are among the bird species benefiting from the hospitality offered by riparian forests in guinea savannah because riparian forests serve as home range to numerous forest birds. However, anthropogenic activities are currently affecting the proper functioning of riparian ecosystems. In this paper, hypothetical and investigated proof documented in literature were used to identify factors militating against survival of African grey parrot Psittacus erithacus and lovebird Agapornis pullaria in a riparian guinea savannah and its implication on conservation programmes and future studies in Africa. The prospect of lovebirds in riparian Guinea Savannah are basically affected by two major factors namely; habitat loss and reduced breeding performance, whereas in African grey parrots, high level of exploitation with respect to pet trade of the said species, in addition to habitat degradation as a result of anthropogenic activities such as mining, hunting, agriculture, urbanization and agroforestry are responsible for loss of nesting site and foraging items. Reduced breeding performance is equally stimulated by decline in reproduction due to age, clutch size, brood parasitism, food shortage, human influence and predation, and pet trade coupled with harvesting. From all indication, so many factors are responsible for decrease in population of African grey parrots and lovebirds. These factors are complicated and habitat based. Understanding the systems which stimulated habitat loss and poor breeding performance in both species are essential in avian conservation. The intervention of non-governmental organizations involves in avian conservation and wildlife conservation advocacy group coupled with government, may be needed, in order to protect the left-over patches of any riparian vegetation, currently existing and serving as habitat to African grey parrots and lovebird in guinea savannah. This will help to prevent total destruction of the environment.

Keywords: African grey parrot *Psittacus erithacus*; lovebird *Agapornis pullaria;* anthropogenic activities; riparian vegetation; habitat loss; breeding performance

INTRODUCTION

One of the global endangered avian species inhabiting lowland and montane forest in West Africa is grey parrot (Tamungang *et al*., 2016). In tropical environment the said species are charismatic, making it an excellent flagship species basically for conservation of numerous tropical ecosystems (Valle, 2015). In sub-Saharan Africa about nine species of lovebirds are established, with more emphasis on island of Madagascar's wooded areas, Central Africa and West Africa, North of the highlands of Ethiopia and South West Africa, all these lovebirds are unique in their respective environmental (Egwumah *et al*., 2014).

In wildlife taxonomy, African grey parrot and lovebirds fall into the order; Psittaciformis, family; Psittacidae and species: *Psittacus erithacus* and *Agapornis pullaria* respectively. They share common taxonomical features making them a

close relative (Borrow and Demey, 2008). Acute information for adequate understanding of habitat selection can easily be obtained from conservation of bird species (Egwumah *et al.* 2014). Transporting parrots for trade has been a common practice since the 1400s and approximately 44 known species have been documented (Egwumah *et al.* 2014) but the major threats to its population are human predation and deforestation which is affecting the sustainable conservation of bird species in Africa (Piebeng *et al*., 2017).

In as much as the global community has been campaign against deforestation, but the degree of forest destruction and loss has persisted. Diverse habitat use encounter has affected the wild grey parrot *Psittacus erithacus* and lovebird *Agapornis pullaria* in the presence of widespread deforestation in its natural habitat especially in guinea savannah and rainforests of West Africa. From all indication, different vegetation types support the survival of the aforementioned species, because of its ability to depend on explicit tree species, basically for precise resources found in its range. For instance, security, roosts, food and nest site or nesting materials at a preferred season of the year (Tamungang *et al*., 2016).

In local market, lovebirds can easily be sighted in cages as pet offered for sale (Egwumah *et al*., 2014), this is as a result of brightly decorated head and twittering vocalization produced at defined interlude, whereas in Parrots its ability to talk and established close relationship with its owner is responsible for the rapid growth in trade because most pet owners are usually captivated by this great talent exhibited by this unique avian species (Annorbah, 2016). Ability to mimic a man should not be taken for a crime and at such pet trade should not be used as a form of deterrent threatening bird populations and welfare.

The said species are associated with fragmented patches and some are native inhabitants to West Africa, utilizing the lowland grassland and forested areas (Perrin, 2009). Parrots are endangered species and more popular than other avian species, based on research they are non-territorial, unpredictable and they have ability to live long (Valle, 2015). All the birds sold in the market in form of pet trade comes from the natural ecosystems (Piebeng *et al*., 2017).

Hunting and international pet trade has affected the natural population of African grey parrots (Peng and Broom, 2021) and lovebirds (Egwumah *et al*., 2014) with highly pronounced adverse effects on biodiversity. According to Birdlife International (2021), population declines of grey parrot in African most populous country, Nigeria has been recorded. However, the major accomplice for the decline is trapping for the wild bird trade coupled with habitat loss and close to 21 percent of the population found in wild are continuously harvested per annum (Mcgowan, 2008).

Among the bird species benefiting from the hospitality offered by riparian forests parrots and lovebirds are inclusive because riparian forests serve as home range to numerous forest birds. Different mixture of landforms is associated with riparian areas including varied communities and environs within Forested lands. This correlation can be used as a background to understand the modifications in the bionetwork and how it affects bird's communities (Naiman *et al*., 2005). Riparian zones are notorious essential parts of the lands carrying out different ecological roles such as reinforcement of the stream barriers and recycling of mineral elements.

However, anthropogenic activities are currently affecting the proper functioning of riparian ecosystems, but working riparian ecosystems form the basis for the generation of numerous goods and services dependent upon by parrots and lovebirds. It also serves as home range that provides refuge to the said species when faced with prospective predators, uninterrupted space uses for social gathering coupled with additional linked to proper functioning of life processes such as building of nest, laying of eggs, feeding, mating, loafing and moulting (Rajpar and Zakaria, 2009).

Hence, the objective of this paper is to give detail summary, using hypothetical and investigated proof documented in literature to identify factors militating against survival of African grey parrot *Psittacus erithacus* and lovebird *Agapornis pullaria* in a riparian guinea savannah and its implication on conservation programmes and future studies in Africa.

The prospect of lovebirds in riparian Guinea Savannah are basically affected by two major factors namely; habitat loss and reduced breeding performance, whereas in African grey parrots, high level of exploitation with respect to pet trade of the said species, in addition to habitat degradation as a result of anthropogenic activities such as mining, hunting, agriculture, urbanization and agroforestry are responsible for loss of nesting site and foraging items (Egwumah *et al*., 2014).

HABITAT LOSS

Habitat loss is basically stimulated by all human activities that are considered to be threat to riparian ecosystems for instance; Agriculture, urbanization, unpredictable climate, forest fires, forest harvesting, livestock grazing, mining, and pollution.

Agriculture

Agriculture can be defined as the cultivation of the soil for growing of crops and rearing of animals to make food

available for human beings, coupled with provision of raw materials such as wool and other products for industrial use (Egwumah 2015). With an increase in human population over time, riparian ecosystems were extensively developed and altered (Poff *et al.,* 2012) due to increase in food production to meet needs of teeming population. Increased agricultural practice stimulates alteration in vegetation structure. Bird species richness are likely to experience a decline from farmland to an aged unplanted land because the percentage of forest cover strongly affect community structure of bird species (Soderstrom *et al.,* 2003) due to modification in the vegetation cover.

With respect to parrots and lovebirds, this is obtainable due to significant variation in population in microhabitats that differs. However, maximum and minimum number of lovebirds were sighted in two microhabitats such as forested land and cultivated land respectively and the difference in number of birds recorded was attributed to farming activities. Farming and other anthropogenic activities are paramount culprits of habitat fragmentation which in turn stimulates variation in biotic communities at the habitat edges. Differences in population of lovebirds may be a product of habitat fragmentation. From studies variation in population of parrots and lovebirds may occur at the edge and interior of fragmented patches (Knight *et al*., 2016).

Variation in bird communities may occur and the number of birds utilizing the edge habitats may not be same with those utilizing the interior habitats because avoidance of predators that are associated with edge habitat is one of the key survival strategies used by parrots and lovebirds in order to increase nest survival (Renfrew *et al*., 2005; Knight *et al*., 2016). Currently, increased predator populations have been documented in agricultural edges based on research findings compares to the past due to increase in farming activities, resulting to more adjacent cultivated landscape been established. Birds are attracted to the adjacent cultivated landscape due to availability of feeding items (Chalfoun *et al*., 2002; Knight *et al*., 2016). Although, this is a very big risky taken by birds to enhance survival, and predators take advantage of this deficient home range that lacks refuge. The quality of forest habitat is degraded due to development of monocropping, mixed cropping, harvesting of forest trees, fuelwood gathering and clean clearing and slashing of grass. The aforementioned factors pose serious threats to the said species and flora communities which render bird species homeless especially tree hole dwelling species (Egwumah *et al*., 2014).

Guerrero *et al*. (2012), examined precise countryside and field-level dynamics and broad view of land use for intense cultivation were not the same. Especially in a comparative study of how farmland with less cultivated crop varieties and bigger fields affects birds' population negatively, with more emphasis on the breeding pairs. From all indication, reduced field edge could be responsible because it makes nesting places, feeding items and cover available to birds.

According to Lee and Martin, (2017), avian species richness increases with landscape heterogeneity. Landscape heterogeneity can be defined as dissimilarities in cultivated crop and other forms of flora protecting the landscape. Heterogeneous landscapes is a landscape made up of dissimilarities flora serving as protective cover to the entire landscape. Heterogeneous landscapes are known for their good ability to make available more niches or stimulate consistency in resources. For instance, feeding items and breeding ground are made available in heterogeneous landscapes compare to landscapes that are the same (homogeneous), mostly heterogeneity at indigenous level is very poor due to serious use of land for farming (Lee and Martin, 2017).

Pesticide use had also been linked with other causal factors substituting for intense farming for example proportion of farmland and the degree of disruption in relation to diverse flora (Gibbs *et al*., 2009). Mineau and Whiteside (2013) also reported intense harmful nature of pesticides residues as a major factor responsible for decline in bird population, whereas Stanton *et al*., (2018) equally reported both application of pesticides on cultivated and loss of home range as key factors stimulating reduction in population of bird species in agricultural landscapes.

If parrots and lovebirds are critically examined from the angle of species-level, the probability of habitation for bird species at the peak, specifically those utilizing open forest canopy and undergrowth plant species, may also increase in population once there is a variation in landscape (heterogeneity). This is a complete demonstration of optimistic correlation between bird species diversity and home range heterogeneity (Tscharntke *et al*., 2012). Once there is variation in landscape there is high possibility of resources utilization by bird species been promoted, because avian species can obtain supplementary home range that holds resources essential for their existence (Tscharntke *et al*., 2012). Apart from that, during reproductive period in agricultural plains controlled by yearly crops meadows managed thoroughly, a very small grassland with less degree of management could serves as safe breeding ground coupled

with provision of feeding spots for parrots and lovebirds (Hiron, 2013) as long as few woody species with tree holes are available to serve as breeding ground for the said species.

Urbanisation

The transformation from rural area to urban centers is known as urbanization and it is associated with increase in construction of modern buildings and roads as a result of increased human population. Urbanization disturbs avian species, but there is a variation in the degree of this effects which could be positive or negative (Egwumah and Iboyi, 2017). Investigation of the effects of build-up land use on bird species centre on affected zone directly, where indigenous home range are modified or substituted by structures and concreted surfaces.

There is a good relationship between decrease reproductive fecundity and breeding success in in bird species with respect to nearness to access road network or road density (Kociolek and Clevenger, 2009). Bird community has demonstrated strong correlation to road-less areas (Kociolek and Clevenger, 2009). This is an integrity test to determine their response to habitat alterations. Some avian species blossom in environmental conditions mentioned above by manipulating exclusive nesting and feeding prospects offered by the surroundings, but this is not applicable to parrots and lovebird as a tree-hole dwelling species.

Parrots and lovebird populations depends on explicit home range necessities. The number and distribution scheme are also responsible for their composition and prolong persistence. For every isolated bird species in a home range, characterized by fragmented patch, the bird species is endangered not because of the proportions and assemblage of the fragmented patches, but by landscape connecting the patch. Excellent management of indigenous vegetation will definitely promote diversity of indigenous bird species. This is imperative, in order to cut down the impact of urbanization on native bird species, floras, riparian watercourse and barriers of natural water bodies must be protected and managed sustainably (Green and Baker, 2002).

Mosaic of variegated and fragmented landscapes has been reported for reduced species richness, whereas home range heterogeneity coupled with reduced human interference can captivate additional avian species (Yuan and Lu, 2016). Yu and Guo (2013), reported that heterogeneity of the surroundings favours local bird richness and stimulate recovery of some vanishing native bird species as a result of reduction in pesticide usage in agricultural fields. Local populace and administrators are equipped with different tools to modify the diversity of metropolitan areas (Taylor *et al*., 2013). Urban areas development has reduced avian species richness (Seress and Liker, 2015) and urbanisation considerably decreases avian species richness. However, bird species that are tolerant to metropolitan areas may not be affected by habitat alterations which is an indicator of advancement of urban areas, thereby leading to an increase in bird species that are capable of adapting to urban areas due to their broad environmental tolerance (Abilhoa and Amorin, 2017). This shows that urbanisation may be responsible for decline in population of parrots and lovebirds due to habitat loss. From all indication, alterations of the environment at limited level can affect bird species by make diverse feeding items and breeding resources available but not enough to sustain the said species.

Unpredictable climate

Climate can be defined as a combination of weather proceedings above a prolonged period. Weather has a huge effect on avian species, this is a well-known problem (Crick, 2004), being both dissimilar and essential. As a result, birds are very sensitive to environmental changes. Norman and Peach (2013), used 23 years' research statistics on capture, mark and recapture techniques to evaluate the survival proportions of bird species between year changes in enrolment. However, the survival of fully-grown birds correlated positively to precipitation in wintering ground in sub-Saharan Africa, but in their breeding sites, dissimilar correlation occurs between precipitations. They reiterated that, additional satisfactory conditions may stimulate a rise in avian population and survival rates of fully-grown birds in their sub-Sahara African wintering sites. Parrots and lovebirds equally need favourable conditions to stimulate increase in survival rates of adults, because survival rate is a function of the number of birds exploiting a specific habitat. As rainfall commences it send vital breeding signals to birds and they are forced to migrate to African. However, the variation in precipitation pattern coupled with the volume of rainfall and period of the year, may affect breeding venture (Boere *et al*., 2006). This could be attributed to climate change because with climate change, the volume of rain may be absence or erratic in some areas, all year round. This could affect the quantity and quality of feeding items available for parrots and lovebird. These categories of birds may not breed once there is a decline in quantity and quality of feeding items available ((Egwumah and Iboyi, 2017).

There is a major relationship between lovebirds and climatic factors. As rainfall increase, there is also an increase in population of lovebirds because increased rainfall provides more food and improved microhabitat for lovebirds to breeding. During rainy season the trees are luscious, resulting to production of more flowers and fruits especially between

the months of August to October. This period coincided with the period when lovebird's populations demonstrated great correlation with precipitation (Egwumah *et al*., 2014). They are more spread in population during the rainy season, but during arid months of the year, they are restricted to rivers bathing, drinking and preening. The presence of water (Warburton and Perrin, 2006) also serves as a paramount factor influencing the distribution of parrots and lovebirds but infiltration of rainwater into the nests could be responsible for nest failure during the nesting period in African grey parrots (Piebeng *et al*., 2017).

Apart from that, food and excellent microclimate are fundamental elements influencing distribution and supporting their breeding performance. Due to variation in environmental temperature, more lovebirds were sighted during chilling environmental conditions in daylight period compare to sunset (Warburton and Perrin, 2006). Anyway, production of sperm takes place at night in fully grown male birds due to lowest receding of body temperature but, hatching failure may occur during breeding season, if the microclimate temperature within the nest cavities is not suitable for parrots and lovebirds. Therefore, food, water and microclimate are essential for healthier home range improvement to enable the aforementioned species breed maximally with little or absence of mortality.

There is also growing evidence from continuous research which shows that, birds have a relationship with their date of laying eggs and increase average temperatures, but the period of laying has great impacts on total breeding performance, because they are tough genetic and phenotypic (Garant *et al*., 2008). In addition to time of breeding and clutch size, which are key indicators of overall reproductive success in birds generally moderate temperature also contribute to improved reproductive success. By modifying their breeding period, variation in climate conditions might likely adjust a number of other factors of reproductive processes in parrots and lovebirds such as the number of clutches and size of clutches, incubation behaviour and recruitment (Egwumah and Iboyi, 2017).

Mining

This is the sequence of extracting minerals from the ground and opencast mining could be one of the reasons why habitat utilized by parrots and lovebirds is disappearing gradually. Gajera, *et al*. (2013) reported that the diversity and abundance of birds were fewer in study areas situated near the mines in relation to study areas that are far from the mines, indicating that mining of minerals and its associated events affects bird abundance, distribution and diversity.

Similarly, Aigbedion and Iyayi (2007) identified exploration, mining and processing as key categories of mineral advancement in Nigeria. These categories of mineral advancement are culprits of diverse forms of ecological destructions and disruption, loss of indigenous flora and fauna, emission of different forms of greenhouse gasses into water, land and air coupled with unevenness of rocks and of soils, environmental degradation and emission of radioactive substances.

Drastic reduction in vegetation structure in a natural forest, cropland and plantation may set in during exploration and exploitation of minerals in riparian ecosystems thereby resulting to loss of habitat. The processing of mining comes with generation of dust which may pollute the environment because large quantity of dust may be release into the atmosphere especially from cement factory (Aigbedion and Iyayi (2007) and this may likely affect parrots and lovebirds due to the level of habitat degradation in the concern locality. Apart from that, mining comes with loud noise which may not be healthy for most avian species utilizing such habitat. Similarly, it reduces the quantity of sunlight trapped by green plant, thereby resulting to decline in photosynthesis in green plants. Therefore, mining may affect the rate of food production in green plants. If plant species dependent upon by parrots and lovebirds are affected by mining, it may result to scarcity or shortage of feeding items.

Forest Harvesting

Forest harvesting is the felling of trees and taking them to saw mills, pulp mills and other processing factories. Forest harvesting in sub-Sahara Africa, increases with corresponding increase in human population due huge demand for forest products and clearing of farmlands for crop production (Aigbedion and Iyayi 2007). Roughly one-third of the global terrestrial surface is protected by forest cover. Forest cover stimulate production of vital services that supports survival of bird species in their habitat coupled with encouragement of key terrestrial biodiversity and carbon storage contained in terrestrial ecosystems (Egwumah *et al*., 2014). Local populace in developing countries utilizes forest trees as a good source of energy for cooking such as fuelwood and charcoal. They also use medicinal plants for treatment of diseases. The aforementioned factors coupled with forest fire, pests and pathogens and deforestation are some of the factors responsible for loss of tropical tree species (Seppälä, *et al.,* 2009), resulting to reduction in quality and size of the home range utilized by parrots and lovebirds.

Forest fires

According to Canadel *et al*. (2021), the mixture of lack of rainfall, increase wind intensity and excessive dry matter on the forest floor are responsible for increase hazardous nature of fire during the dry months of the year. However, with

climate change narratives, more communities have been admitted into fire prone areas, especially those living in nearness to woodlands or savannah, are currently at risk. This risk is increasing on daily basis due to variation in climate conditions, resulting to reduction in quality and size of the home range utilized by parrots and lovebirds.

Livestock grazing

This is the manner of feeding in which herbivore feeds on plants such as legumes and grasses. In terms of international livestock management, livestock grazing is a major culprit of prevalent land use (Liebig *et al*., 2006) occupying approximately 25% of Earth's terrestrial surface (Asner *et al*., 2004). The all-embracing zones occupied by grazing land, makes it to be considered as a vital resource for sustaining biodiversity (O' Connor, 2005) and livelihood of local populace (Eriksen and Watson, 2009a; Muhumuza and Byarugaba, 2009). However, diverse forms of land use and its application may impact negative on riparian zones in guinea savannah. For example, rearing of farm animals, row crop farming, wood production, and expansion of rural areas, crude oil and gas processing (USDA, 2014).

Cattle loves riparian zones because, it provides drinking water, excellent fodder, plant canopy to shield them from harsh atmospheric conditions. Therefore, this type of farming may promote woody plant encroachment (Archer *et al*., 2017). Woody plant encroachment is a serious menace that is widespread, in grasslands and savanna ecosystems worldwide, making it an indicator of land degradation (Auken, 2009). Land degradation has become a public outcry by international communities in recent time, due to rapid increase in livestock production, with corresponding habitat degradation for avian species.

The findings of Nakamura and Yamada, (2005), on the impact of grass advancement on the biological roles of riparian areas consolidated this fact because the diameter at breast height of tree species (DBH) and quantity of timber decreased significantly with establishment of pasture. This is not healthy in terms of prospective survival of parrots and lovebird in guinea savannah. Livestock grazing is responsible for habitat degradation, loss of woody species which in turn stimulate reduced breeding ground and shortage of feed supply to birds.

Pollution

Parrots and lovebird make use of some vital mineral elements, but toxicity may set in if the permissible limits are exceeded. This can affect reproductive fecundity, function and behavioural characteristics. However, accumulation and bio-magnification of heavy metals from food web or food chain is possible in bird species (Egwumah *et al*., 2017). Heavy metals may get into bird species from straight inhalation, food eaten, and absorption through contact with the skin. This is also a latent killer of avian and other wildlife species (Tang *et al*., 2013). Arsenic and its associated complexes are carcinogenic to avian and other wildlife species. Impairment in the nervous system and immune roles may result from lead due to lead poisoning. Lead and cadmium poisoning might promote decline reproductive and development performance in parrots and lovebirds. Consuming just little amount of cadmium might have a negative effect on health and physiological condition of parrots and lovebirds.

REDUCED BREEDING PERFORMANCE

Reduced breeding performance is equally stimulated by decline in reproduction due to age, clutch size, brood parasitism, food shortage, human influence and predation, and trade coupled with harvesting.

Decline in Reproduction due to Age

In African Grey parrots breed between the ages of three to five years and they will continue breeding until up to twelve years of age (Stephens, 2022) and in their natural habitat African Grey parrots starts breeding between March to April (Piebeng *et al*., 2017). On the other hand, lovebirds breed between the ages of ten months and five and they will continue breeding until up to six years of age. However, in their natural habitat lovebirds starts breeding between March to April and June to July and they usually nest communally (Narayanan, 2015). However, as both birds advance in age survival and reproductive performances usually escalate with age. It will then stabilize at mid-age, but at old age a decline will set in, in each of the aforementioned species due to manifestation of senescence (Frédéric *et al*., 2007).

Three main hypotheses were suggested by Frédéric *et al*. (2007), to explain avian species performance frameworks: firstly, the restricted hypothesis accuses young birds of been less capable to reproduce, because they lack basic experience needed for effective reproduction. Apart from that, their reproductive organs are not well developed. Reproductive experience can be acquired and developed through years of egg laying, because knowledge advancement is connected to age. Ability to forage very well, lay and incubate eggs couple with taking care of offspring or nestling equally increases with age (Paviour, 2013).

Secondly, the restraint hypothesis proposes that breeding attempt intensify with age, while the left-over reproductive worth decrease (death rate increases and fertility declines) resulting to more important breeding measures being taken.

Thirdly, the selection hypothesis proposes progressive withdrawal of less quality phenotypes. This process equally brings about improved reproductive performance, if age is put into consideration (Paviour, 2013). In this perspective,

phenotype means the physical and physiological appearance of African grey parrots and lovebirds, for instance in African grey parrots, darker silvery gray coloured head whereas in lovebirds, brightly coloured head. Phenotypic quality that are low in both birds are usually dominated, by high quality types resulting to comparative rise in reproductive performance with respect to age. Identification of age in the aforementioned species is very easy in most cases, especially those in cages. However, surveillance can be used to determine their age. In African grey parrots, young ones from the age of three to five years may breed, whereas in lovebirds, young ones from the age of five to ten months either in the wild or in captivity may breed. If mating occurs between two birds of the same parents or bloodline, inbreeding depression will retard the growth rate and survival ability (Egwumah and Iboyi, 2017) of the offspring.

Clutch Size

African grey parrots may start mating from 3 years of age and will produce a clutch of 3-5 eggs beyond two weeks (Piebeng *et al*., 2017), whereas, lovebirds may start mating from ten months of age and will produce a clutch of 4-6 eggs within 23 days. Fortunately, both species utilizing natural cavities established in the trunk of giant tree as nesting sites and they lay eggs that are white in colour. Clutch size ranges between 3 to 5 (Piebeng *et al*., 2017) and 4 to 5 (Narayanan, 2015) for African grey parrots and lovebirds respectively. If the age and health of lovebirds are put into consideration, the eggs laid will range from 2 to 7 (Egwumah and Iboyi, 2017).

In most cases, a hen will not start incubating till the second or third egg is laid. Clutch size has a notorious effect on the breeding performance of diverse avian species with parrots and lovebirds inclusive (Paviour, 2013). However, it is believed in a good number of wild birds clutch size can be controlled using adaptability to promote efficiency and survival at optimal level (Paviour, 2013). This is also a component of their life cycle, using cost benefit strategy.

Bird lays a specific number of eggs based on the mechanism controlling follicle growth and ovulation in the ovary. If this is modified, it will definitely control the internal and external factors. This is an approach to the problem of the proximate determination of clutch-size. On the other hand, evolution is also responsible for development of the size of the clutch.

According to Egwumah and Iboyi, (2017), it appears to be widespread practice among breeders to withdraw nest boxes from couples after the females have laid a second or third consecutive clutch. This is done believing that, it reduces further laying and the physical exhaustion of females. It also prevents unsuccessful broods either because the embryos will be too weak to hatch, or the chicks will be too weak to survive thereby leading to poor breeding performance.

Brood Parasitism

Overtime research work has suggested that factors that influence condition on breeding ground especially those with limited productivity, can have significant impact on population dynamics (Rock, 2011). Brood parasitism, can be defined as a process where by a female deposit egg in the nests of another female. Instead of building or searching for their own nest cavities they cannot afford such trouble rather they lay eggs in the nest of other breeding birds and allow them to foster them on their behalf. Brood parasitism can also bring about poor breeding performance, due to poor parental care for nestlings. Parrots and lovebird are tree-hole dwelling species but high rate of deforestation and demand for timber by the populace resulting to inadequate tree cavity for breeding may be forced to practice brood parasitism.

Food Shortage

Birds uses the presences of prey items or food to select home range where foraging activities can be carried out. If habitat preferences of bird species are well understood, it may promote species conservation using such vital information. From observation more lovebird was sighted in forestland vegetation which is an intact forest with abundant food items which promotes good breeding performance.

The quantity and varieties of food present matters a lot (Egwumah and Iboyi, 2017). If the comparative approach is used to compare the vegetation in which parrots and lovebirds forage in the afternoons and evening in a preserve area, it will enable us to understand better the role of food in sustenance of large population of bird species in the wild, because without food the population will gradually cease to exist.

Human Influence and Predation

Egwumah *et al*. (2014) reported considerable increase on population of lovebirds in forested land compare to another micro-habitat. They reiterated that excellent breeding sites, absence or less interference from the local populace and sufficient supply of feeding items are capable of promoting breeding performance in bird species. However, food enhances nurturing of nestling.

This was further proven, using the result of diameter at breast height (DBH) of tree species in varied micro-habitat with forested land having increased considerable difference in DBH compare to any other micro-habitat. Parrot could also be attracted to areas with more forested cover due to lower human interference because they are highly sensitive to rapid changes in forest cover due to decrease in populations of close relatives such as lovebirds from all indication. The prospective threats to communities of parrots and lovebirds with respect to their breeding ground are increase farming, basically for self and family up keep, logging, harvesting of

fuelwood, charcoal production, and clean clearing of grass, wildfires and livestock grazing.

Predation, discarding of nests by breeding pair and chicks falling from nests are all responsible for nest failure during the nesting period in African grey parrots (Piebeng *et al*., 2017). Predation did not always result in the complete loss of the brood, but it did reduce the quantity of eggs and, more importantly, the number of nestlings produced. Bees' occupation of nests, the natural fall of trees concealing the nest by the winds, destruction of nest by local populace, and nest congestion by lianas or surrounding vegetation all equally contribute to low breeding performance. The palmnut vulture *Gypohierax angolensis* and other kinds of hawks were the primary predators of the species according to Piebeng *et al*., (2017), followed by men and squirrels.

Trade and Harvesting

With habitat disturbance, indiscriminate felling of trees for timber production coupled with mono-cropping, bird species are gradually losing more habitats.

In case of parrots and lovebirds, more of this species will be exposed to poachers who are involved in trade and traditional harvesting, especially fewer resistant species (Egwumah *et al*., 2014). However, their breeding performance can also be altered, if and only if such avian species must have initiated their breeding process by laying few eggs before been captured and taking into captivity as pet. Once birds are caught and taking into captivity, they may never have access to their eggs again. In most cases, the eggs could be consumed by human especially children. Numerical effects of harvest primarily are restricted to sub-adult and floating adult components of the populations (Millsap and Allen, 2006) which can also influence breeding performance of the said species negatively.

Human activities associated with harvesting of lovebird *Agapornis pullaria* include blocking the mouth of a tree-hole and cutting it down, setting a platform of sticky gum by the tree-hole that catches the bird, and setting a cage with a life bird inside where the distress call by the bird attracts other bird to search for an entry into the cage. These methods of harvesting could pose a threat to the survival and breeding performance of parrots and lovebirds (Zharikov and Skilleter, 2004). Conversely, total of 2694 Lovebirds were taken into captivity within the study period. Human disturbance may prompt bird species to develop migratory attributes especially those with wide home range, while those with narrow home range try to adapt and, in the process, they are force to forage in less quality habitat, since breeding success and survival rate are very essential. Transfer of genetic materials from one generation to another requires breeding success. Apart from that, it will also combat the rapid extinction of bird species because breeding success can be influenced by food and excellent breeding ground (Egwumah *et al*., 2014). If the aforementioned factors are lacking, bird species with narrow home range may find it difficult to adapt and they may die in the process. If this death rate is sustained for some period, and allow to cut across large population size, it will make the bird species to be threatened, vulnerable, endangered or even go into extinction.

EFFECTS OF LOSS OF HOME RANGE ON PARROTS AND LOVEBIRDS

The special effects loss of home range on prospective wild population of parrots and lovebirds are;

i. Increase in competition on foraging site because the choice made one bird is dependent on choice made by others.
ii. Birds' survival is dependent on its ability to forage very fast and dominate
iii. Most parrots and lovebirds may be forced to seek supplementary food source.
iv. Local carrying capacity of aforementioned species may be exceeded in guinea savannah due to habitat fragmentation, habitat degradation and habitat loss. This will force more birds to concentrate around limited resources.
v. Decrease in population of parrots and lovebirds may set in.
vi. Presence of human disturbance may stimulate low productivity and slightly higher mortality in both species.

CONCLUSION AND RECOMMENDATIONS

Conclusion

From all indication, so many factors are responsible for decrease in population of African grey parrots and lovebirds. These factors are complicated and habitat based. Understanding the systems which stimulated habitat loss and poor breeding performance in both species are essential in avian conservation.

Recommendations

The intervention of non-governmental organizations involves in avian conservation and wildlife conservation advocacy group coupled with government, may be needed, in order to protect the left-over patches of any riparian vegetation, currently existing and serving as habitat to African grey parrots and lovebird in guinea savannah. This will help to prevent total destruction of the environment.

There should be total ban on trade of both species to promote prospective increase in population. Heavy penalty should be melted on poachers for capturing parrots and lovebirds. It becomes imperative that; new laws should be enacted and

existing old laws should be reviewed and enforced properly. This will also stimulate proper conservation of African grey parrots and lovebirds for yet to be born generations.

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