Journal of Ecosystem & Ecography

Research Article Open Access

Aggregation Influence of African Grey Parrots (Psittacus erithacus) On Environmental Exploitation in Limbe Botanic Garden, Southwest Region, Cameroon

Melle Ekane Maurice*

Department of Forestry and Wildlife, University of Buea, P. O. Box 63, Buea, Cameroon

Abstract

Aggregation formation in parrots is a survival strategy that contributes to social and individual activities. Navigation to different feeding locations and continental migration to avoid environmental stress factors such as winter has been achieved in birds through their social organization and group formation. Formation of strong groups in birds like the parrots enables them to reach food locations, defend themselves, mate, and learn from one another. The aim of this study was to examine the importance of group formation to the social activities of African grey parrots in Limbe Botanic Garden. Data collection was carried out for three months, and involved a daily data recording method from 8:00 am-5:00 pm together with some environmental factors. Results revealed a positive significance between African grey parrot groups and their behavior, X2 = 97.555 df=16 P=0.000. The highest observation on parrot-grouping behavior was on 2 parrots 57% and the least was 6 parrots 1%. More so, group behavior revealed a weak significance X2 = 4.671 df=4 P<0.05 on photoperiod. Additionally, bird groups recorded significance X2 = 3.773 df=12 P<0.05, and X2 = 14.958 df=12 P<0.05 on atmospheric conditions and food resources respectively. The grey parrots have a craving feeding love for oil palm fruits, and since the area is rich in oil palm, the highest feeding observation was recorded on fruits 74%, leaves 18%, insects 4%, and seeds 4% respectively. Parrots' morphological plumage beautiful attraction and their capacity to mimic human and other sounds have won them great human love for pet domestication, a situation that has widen the international pet-trade. Captive breeding of the grey parrots is done in some countries such as Cameroon at a small scale, meaning there is need for more research to be carried out for their population enhancement. Protection of the grey parrots is important to the conservation world, and a decreasing population of this bird species in Cameroon has urged the Ministry of Forestry and Wildlife to restrict its harvesting for pet-trade market by classifying it as class "A" wildlife species that should not be harvested. Additionally, IUCN has documented this species of parrot in the red data list category as endangered, meaning its population is alarmingly reducing and needs an urgent conservation management strategy. This study recommends a detail and comprehensive inventory research on its population, behavior, feeding, and social ecology.

Keywords: Wildlife; Parrots; Plumage; Group-behavior; Captive-breeding; Conservation

Introduction

Parrots have long been thought to have complex social interactions and to exhibit complexity in their social organization. However, parrot sociality is poorly understood, largely because wild individuals are difficult to capture, individuals are difficult to observe consistently because of their high mobility, and many types of marks are readily destroyed. In addition, group membership may be quite fluid in many species, although the extent of this fluidity is difficult to gauge, given the problems with marking and following individuals. Social structure can fundamentally affect the fitness of individuals by influencing how they utilize space, gain access to resources, or interact with others. Social associations with conspecifics, such as shared group membership, can increase foraging efficiency (Smith et al. 1999), predator avoidance (Lima et al. 1999), and reproductive output of individuals. Species display a wide range of social patterns, from largely solitary species in which pairs associate primarily during breeding seasons to more socially complex groups with many individuals, long-term bonds, and differentiated social relationships [1].

Despite these difficulties, understanding the social systems of parrots is critical to understanding social processes such as vocal learning and the spread of behaviors. Many parrot species are threatened or endangered and increased understanding of how they structure their social interactions could improve our ability to manage these populations. Parrots also show evidence of cognitive complexity, and greater understanding of their social complexity may provide insight into how social and cognitive complexity evolved. Our existing knowledge of parrot social structure is based on a variety of approaches. Social structure has been directly observed in captive groups in non-natural laboratory settings, through tracking a small number of wild individuals (, and through observing individually marked birds in the wild. Social structure has been more indirectly inferred from natural-history observations of unmarked wild populations, results of audio playback experiments in the wild and in captivity, the geographic structure of vocalizations in wild populations, and observations of social behavior in captivity (Figure 1) [2].

On the basis of these previous studies, several general assumptions have emerged and are widely cited. First, parrot sociality is widely assumed to revolve around the pair bond, with breeding pairs

***Corresponding author:** Melle Ekane Maurice, Department of Forestry and Wildlife, University of Buea, P. O. Box 63, Buea, Cameroon, E-mail: melleekane@gmail.com

Received: 03-Oct-2023, Manuscript No: jee-23-116038; **Editor assigned:** 05-Oct-2023, Pre-QC No: jee-23-116038 (PQ); **Reviewed:** 19-Oct-2023, QC No: jee-23-116038; **Revised:** 21-Oct-2023, Manuscript No: jee-23-116038 (R); **Published:** 27-Oct-2023, DOI: 10.4172/2157-7625.1000454

Citation: Maurice ME (2023) Aggregation Influence of African Grey Parrots (Psittacus erithacus) On Environmental Exploitation in Limbe Botanic Garden, Southwest Region, Cameroon. J Ecosys Ecograph, 13: 454.

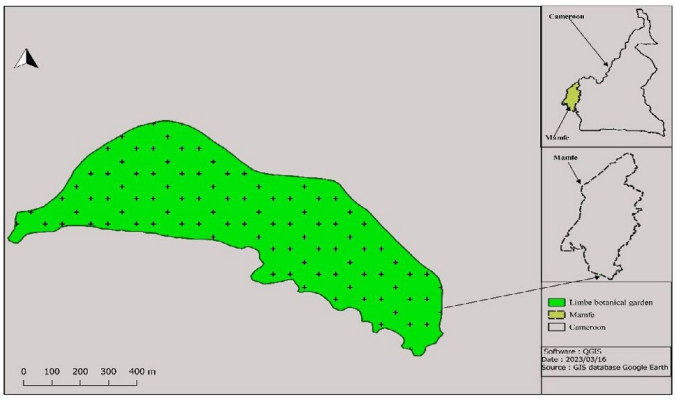

Figure 1: Limbe botanic garden.

functioning as the "fundamental social unit," largely because wild parrots are often observed flying in groups of 2. However, to our knowledge, this assumption has not been quantitatively tested in any parrot species other than captive Budgerigars. Second, many parrot species are described as having fission–fusion social structures, largely on the basis of their variable flock sizes within and across days. Species with fission–fusion social structure are characterized by groups that repeatedly split into separate subgroups and then merge again. Previous research suggests that parrot vocalizations, especially contact calls, may be used to mediate fission–fusion events, although this has been difficult to test because the extent and characteristics of fission–fusion dynamics and the resulting social structure of groups have not been previously quantified for any parrot species. Referring to a species' social structure as "fission–fusion" without quantifying these dynamics does not provide much insight into the social dynamics of groups. Third, there has been very little consideration of how dominance hierarchies might affect group dynamics in wild parrots [3,4].

Wildlife conservation in the tropical rainforest is facing enormous challenges due to human population increase that needs to cultivate the rainforest for household sustainability. Migratory bird species that can cover hundreds and thousands of kilometres to new locations when threatened environmentally have succeeded in population increase. However, the African grey parrots are not known with this kind of migratory characteristics, hence their population is facing conservation and protection challenges in their endemic niches in Cameroon. Their morphological plumage beautiful attraction and their capacity to mimic human and other sounds have won them great human love for pet domestication, a situation that has widen the international pet-trade. Captive breeding of the grey parrots is done in some countries such as Cameroon at a small scale, meaning there is need for more research to be carried out on population enhancement [5].

Methodology

Limbe Botanic Garden (LBG) is the first botanical garden in Cameroon and the oldest in Africa. It was created in 1892, during the German colonial era, in Victoria (former name of Limbé), between the ocean and Mount Cameroon at 4°0'49.46″N and 9°12'3.13″E. Initially intended for agricultural purposes, it has become one of the main curiosities of South West Cameroon Region. The Garden has also served as a training center for Cameroonians in the fields of agriculture, horticulture and forestry. It is also an international center for biodiversity research.

Today, the garden, which originally covered 250 hectares, has only 48 hectares, the rest (202 hectares) is the rainforest. The garden has about 1,500 taxa (1,000 herbaceous and 500 woody plants). There are rare or endangered plants: 150 endemics, 100 from the south-west, including Calamus sp, Prunus africana, Gnetum spp. Some plants are the object of particular attention, notably the African palms, the endemic plants of Mount Cameroon, the Musa spp. Others are cultivated for conservation purposes: Irvingia gabonensis, Garcinia kola, Afrostyrax kamerunensis, Cola spp, Prunus africana, Gnetum spp, Pterocarpus soyauxii, Diospyros, Rauvolfia vomitoria, Nauclea diderrichii, Terminalia spp, Enantia chlorantha, Eremomastax speciosa, Bryophyllum spp and Physostigma venenosum. The botanical garden also houses a herbarium, which in 2001 had about 21,000 specimens and more recently 30,000. Its acronym in the Index Herbariorum is SCA [6,7].

Data collection was done for a period of three months, each day from 8:00 am – 5:00 pm. However, the research data collection method was tested to have a feasibility confirmation on the variable to be used during the process. A letter of authorization was written by the Department of Forestry and Wildlife to the authorities of Limbe Botanic Garden for research approval before the data collection was launched. The Garden has a longstanding reputation on the conservation of many endangered species of plants, and rainforest area where this study was carried out. The rainforest vegetation area has many species of wild birds, including the African grey parrots, believed to be homed by the zoological garden. The parrots' aggregation was the main variable tested on social behavior, photo-period, and the atmospheric conditions.

The research data was analyzed by using SPSS version 25, with the help of statistical models, such as chi-square and spearman correlation. Analysis started with exploratory statistics, and later the variable were subjected to a further test of inferential statistics. The grey parrots' aggregation was tested against their behavior, photo-period, and atmospheric conditions. Hence, the results of analysed data were displayed on bar-charts, pie-charts, and graphs [8-10].

Results

There was a positive significance between aggregation of African grey parrots and their behaviour, X2 = 97.555 df=16 P=0.000. Parrots are tropical rainforest birds that are attractively interesting to human entertainment because of their ability to mimic human sounds, especially the African grey parrot known to be endemic in the forest of gulf of guinea. However, parrots have faced conservation challenges in the past decades due to habitat loss, poaching, and pet trade. Hence, the grey parrot population has alarmingly reduced and has been considered by IUCN as an endangered species. In Cameroon, this parrot species has been classified as category "A" wildlife species, meaning it's highly protected. The highest observation on parrot-aggregation behaviour was on 2 parrots 57% and the least was 6 parrots 1% respectively. Some parrot species, such as the grey parrots are known to form bonded pairs of two in courtship monogamous relationships. During incubation of eggs by the adult female, the adult male partner goes and brings food for her in their tree-cavity nest. This parrot species is known to form this bonded pairs for years, the reason most researchers consider them as monogamous. Though, this study could not clearly differentiate the sex of the paired birds, it's believed that their monogamous courtship characteristics created attraction to both male and female. Understanding how they are attracted to each other on the formation of longstanding relationships is a huge research challenge to ornithologists (Figure 2).

Grey parrots are diurnal birds, very active in the day and sleep in the

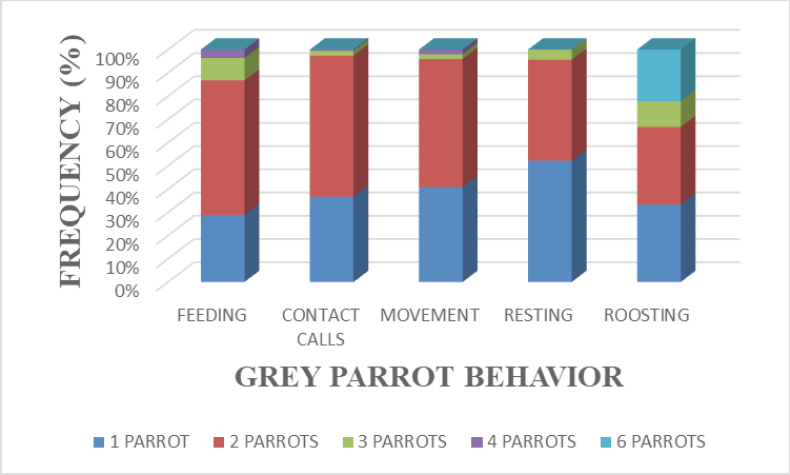

Figure 2: African grey parrot aggregation and behaviour.

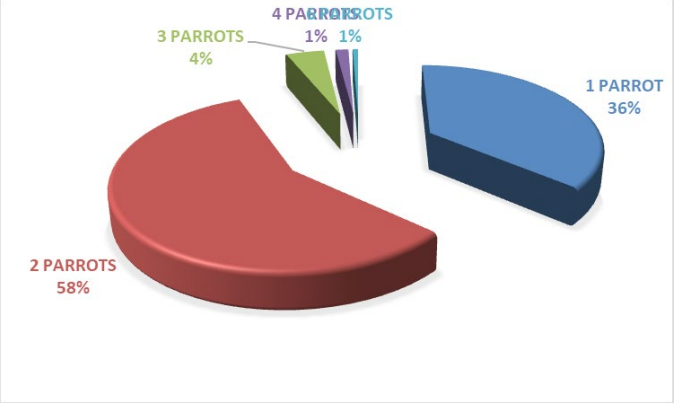

Figure 3: Aggregation behavior of the parrots.

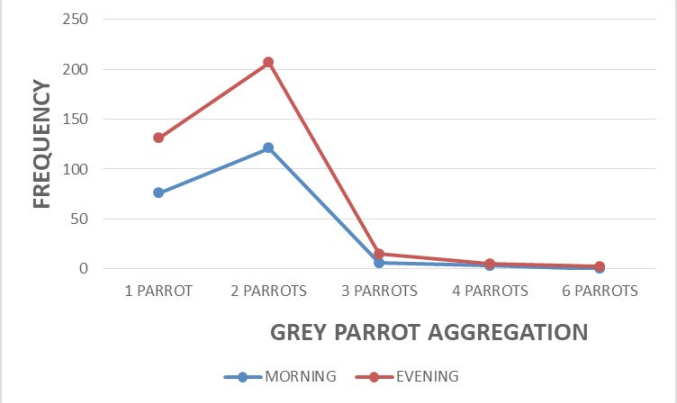

Figure 4: Aggregation behavior and photo-period.

night period. However, the study recorded a high aggregation activity during the evening period, engaged from 12:00am – 5:00pm compared to the morning period from 8:00am-11:59 am. Most wildlife behavioral activities carried out in many areas indicates a higher group activity profile during the morning period; however, the heavy rain atmosphere might have been the cause of the reverse. Birds were observed resting inside the tree-shades during the period of rain and would bounce back into feeding and movement after the rain, especially during afternoon period. Notwithstanding, during mild rain, bird behavior such as play and roost were observed while heavy cold rain was avoided to prevent their body system from hypothermia (Figure 3).

The diurnal activities favored courtship pairs compared to other groups observed, even during heavy rain, they were observed sheltering inside tree shades in pairs of two. Most bird species are diurnal, with a high concentration of activities during the morning period, especially on feeding to acquire and recover the energy lost at night. Birds were observed by the research team resting during the mid-day period, starting feeding activity during the afternoon and evening periods, preparing for the night rest (Figure 4).

Also, bird aggregation recorded significance X2 = 3.773 df=12 P<0.05, and X2 = 14.958 df=12 P<0.05, on atmospheric conditions (Figure 5) and food resources respectively. In wildlife species, the atmospheric condition determines the activity budget for the day. A prolonged cold rainy atmosphere has effect on wildlife feeding activity because resting is given priority at the expense of other activities, such as feeding, since movement to feeding sights at that time is prevented. Similarly, some species of wildlife are forced into hibernation during heavy winter periods in the temperate and polar climatic atmosphere. Birds from the winter areas are known to migrate to the tropics to escape winter season, travelling thousands of kilometers away and would return after this period.

Food availability is a key environmental component determining endemism in wildlife, and the absence of sufficient food most often trigger displacement to food-rich areas. The grey parrots have a craving feeding love for the oil palm fruits, and since the area was rich in oil palms, the highest feeding observation was recorded on fruits 74%, leaves 18%, insects 4%, and seeds 4% respectively. Feeding on the botanic garden vegetation located at the coastal sea-shore of Limbe city is more convenient for these birds compared to other areas not rich in food resources, requiring more movement energy to forage on the spatial food distribution. Red oil palm (Elaeis guineensis) is richer in energy value, much needed by the body metabolism of parrots compared to others with low energy value like fresh leaves, and seeds (Figure 5).

Discussion

Parrots represent an intriguing possibility for comparative research on the origin and evolution of social complexity because they share many characteristics with hominids and other primates. Both parrots and primates have similar relative brain volumes, are long-lived, have extended developmental periods, live in complex social groups, and

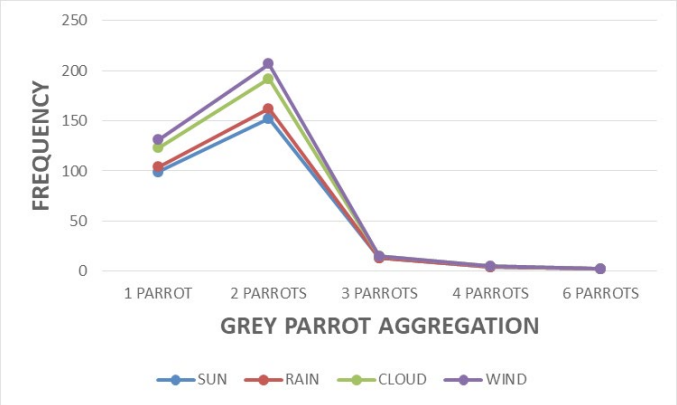

Figure 5: Aggregation behavior of parrots and the atmosphere.

show evidence of advanced cognition. Parrots also share additional characteristics with humans, which display the highest social and cognitive complexity of any species. Parrots are among the few taxa that display vocal learning, which is a defining characteristic of humans but is not widespread in nonhuman primates. The structure of socially learned parrot vocalizations often varies regionally, and social factors are known to have a strong influence on vocal learning. Because vocal learning is fundamentally a socially driven phenomenon, deeper understanding of why parrots learn calls from certain individuals could provide insight not only into factors that affect vocal learning in parrots, but also into the evolution of vocal learning and social complexity. The high fission–fusion dynamics likely present in many parrot species may also more closely resemble the high fission–fusion dynamics of human groups and may provide insight into the selection processes that drive sociality in our own species.

Effective navigation, and subsequently larger home ranges, should be beneficial for group members. Larger areas encompass a greater diversity and abundance of resources needed to meet group members' nutritional needs, and moving to more new areas increases the probability of discovering new food resources. Using larger areas can also allow groups to be more variable in their movements, which could make them more unpredictable to predators (Roth and Vetter, 2008) and thus decreases predation risk (Richardson et al., 2018). Thus, all else being equal, such as environmental characteristics, the members of a group with a relatively larger home range should have higher survival in periods of resource limitations and/or greater reproductive output than an identical group with a smaller home range. In reality, home-range size is often limited by many factors, including competition for space with other groups. However, many group-living species live in non-territorial societies, where groups can benefit from exploiting a home range without paying the costs of intergroup fights and competition. In such species, groups can interact affiliatively and preferentially with specific other groups, resulting in a multilevel society. In such societies, having a larger home-range size might generate more chances to associate with conspecifics from other groups, which, in turn, can increase mating opportunities (by increasing contact with members of the opposite sex;, dispersal opportunities (as sub-adults often disperse to neighbouring groups; and information sharing about food resources or predation risk.

However, living in large groups can also introduce challenges, particularly in species that maintain stable group membership. Collective movement requires maintaining cohesion, a challenge that increases with group size and in more complex environments. From a movement perspective, coordination among many individuals could result in slower decision-making, due to both coordination challenges as well as larger groups being likely to harbour more conflicts of interest. For example, one study of collective movement in baboons found that the probability that an individual baboon followed one initiator versus the other was much lower when both disagreement among initiators on where to go and the number of initiators increased Larger groups are also likely to have slower movement speeds while 'on-the-go'. We all have personal experiences of how much slower it can be to move or make decisions (such as where to have lunch) when we are in a large group, as the group generally may have to conform to the slowest members or satisfy a diversity of preferences. Finally, it may be more challenging for individuals to influence larger groups to move to new areas, and thus to extend the group's home-range. These factors suggest that the consensus costs borne by larger groups will ultimately limit the size of the home-range that such groups can exploit.

In many species, individuals benefit from social associations, but they must balance these benefits with the costs of competition for resources. Understanding how these competing factors generate diversity in social systems is a major goal of behavioral ecology, but one that has been hampered by a lack of basic data quantifying many aspects of social structure and associations. Although parrots are generally assumed to have complex social groups, few studies have quantitatively examined these assumptions about parrot social structure. Future research on social structure and social interaction patterns in parrots and other highly social avian taxa could provide insight into the evolution of complex sociality, cognition, and intelligence in other species. Hypotheses such as the social intelligence hypothesis, the Machiavellian intelligence hypothesis, the social brain hypothesis and the social complexity hypothesis (Barton 1996) all propose that large brains are adaptations to perceive and process the complex social relationships that are characteristic of many primate species. Although research into the evolution of social complexity originally focused on primates, other species are also unusually large-brained and cognitively advanced, such as elephants, cetaceans, and pack-hunting carnivores among mammals, and corvids and parrots among birds.

Conclusion

Formation of aggregation in wildlife is a key survival strategy for defense, feeding, breeding and many other related activities. Parrots are important to humans because they provide a rich source of protein to feeding, entertainment because of their ability to mimic human sounds, and the pet trade. However, the population of parrots has drastically reduced due to habitat loss to agricultural cultivation in the tropics where most species are endemic and poaching activity. The tropical forest is the endemic home to most species of parrots, unfortunately it's the most destroyed by humans for cultivation and infrastructure. African grey parrots, found in the gulf of guinea are attractive to humans due to their plumage morphology. However, the study carried out in Limbe Botanic Garden on the aggregation behavior of these birds showed a high degree of pairing identity, believed to be due to their courtship monogamous nature. Protection of the grey parrots is important to the conservation world, and a decreasing population of this bird species in Cameroon has urged the Ministry of Forestry and Wildlife to restrict its harvesting for pet-trade market by classifying it as class "A" wildlife species that should not be harvested. Additionally, IUCN has document this species of parrot in the red data list category as endangered, meaning its population is alarmingly reducing and needs an urgent conservation management strategy. This study recommends a detail and comprehensive inventory research on the grey parrot population, behavior, feeding, and social ecology.

References

1. Heidt V, Neef M (2008) Benefits of urban green space for improving urban climate. Eco, plan, manage urb forest: Internat perspect, Springer: New York 23: 84-96.
2. Duryea ML, Blakeslee GM, Hubbard WG, Vasquez RA (1996) Wind and trees: A survey of homeowners after hurricane Andrew. J Arboricul 22: 44-50.
3. CNT (2010) Integrating valuation methods to recognize green infrastructure's multiple benefits. Center Neighbor Tech 11: 245-255.
4. Nowak DJ, Crane DE (2002) Carbon storage and sequestration by urban trees in the USA. Environ Pollu 116: 381-389.
5. Sanders RA (1986) Urban vegetation impacts on the hydrology of Dayton, Ohio. Urb Eco 9: 361-376.
6. Xiao Q, McPherson EG, Ustin SL, Grismer ME, Simpson JR (2000) winter rainfall interception by two mature open- grown trees in Davis, California. Hydro Proc 14: 763-784.
7. Iyer Vijayan Gurumurthy (2015) Environmental and Quality Management for the Higher Education Institutions to Achive Research and Academic Excellence. Journal of Modern Education Review.
8. Iyer Vijayan Gurumurthy2015) Social Impact Assessment Process for an Efficient Socio- Economic Transformation towards Poverty Alleviation and Sustainable Development. Global Journal on Advances in Pure and Applied Sciences.
9. Iyer, Vijayan Gurumurthy (2007) Design and Production of an Eco-friendly Technology for the Processing of Cotton Fibers . Journal of Textile Association (India).
10. Iyer Vijayan Gurumurthy (2007) Eco-Friendly Rubberized Cotton Fabric Roller Development for Cotton Roller Gins. Journal of Agricultural Safety and Health.