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Impact of Weather Changes on the Foraging Strategy of Pied Crow (*Corvus albus*) on Waste Materials in Bonaberi, Douala, Littorial Region, Cameroon

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Abstract: *Pied crow (Corvus albus) is a highly adaptable and opportunistic scavenger species that has successfully colonized many urban and peri-urban areas across the African continent. The impact of weather changes on pied crow foraging behavior in different African regions can have important implications for waste management strategies and the mitigation of the potential negative impacts of these urban-adapted birds on local ecosystems. This study aimed to investigate how changes in weather condition influence the foraging strategy of pied crow (Corvus albus) on waste materials in Bonaberi neighborhood of Douala in Cameroon. Observational surveys were conducted over a 4-month period in Bonaberi to monitor the foraging behavior of pied crows. Data were collected on crow numbers, time spent foraging, food types consumed, and foraging locations during both the dry and rainy seasons. Weather data, including sunshine, rainfall, cloud cover, and wind speed, were also recorded. Statistical models were used to analyze the relationship between weather variables and pied crow foraging patterns. In this study, weather condition revealed a significant association on day-period $X^2=116.908$ $df=6$ $P=0.000$, aggregation behavior of birds $X^2=12.514$ $df12$ $P<0.05$, and the behavioral activity of birds $X^2=27.937$ $df=9$ $P=0.001$ respectively. Additionally, weather changes significantly associated with various food-types birds $X^2=55.011$ $df=15$ $P=0.001$. More so, weather changes showed a significant relation on the presence of humans on dumpsites $X^2=13.968$ $df=6$ $P=0.030$. Furthermore, changes of weather and highway traffic intensity associated significantly $X^2=15.804$ $df=6$ $P=0.015$. Also, the aggregation of birds and their location at dumpsites associated significantly $X^2=17.528$ $df=12$ $P<0.05$. More so, the aggregation of birds showed a significant relation on their activity $X^2=14.477$ $df=12$ $P<0.05$. The study demonstrates that pied crows exhibit behavioral plasticity in their foraging strategies in response to seasonal changes in weather patterns. The increased utilization of waste materials during the dry weather suggests that these urban-adapted birds play an important role as scavengers in managing solid waste, especially in developing regions where waste management infrastructure may be limited. Understanding the relationship between weather changes and pied crow foraging behavior on waste materials is*

crucial for developing effective waste management strategies and mitigating the potential negative impacts of these urban-adapted birds on local ecosystems across Africa.

Keywords: Foraging Strategy, Pied crow, Weather changes, Dumpsites, Waste materials

INTRODUCTION

Urbanization and the associated increase in anthropogenic waste materials have led to the proliferation of generalist scavenger species, such as the pied crow (*Corvus albus*), in many developing regions (Marzluff & Neatherlin, 2006; Oro et al., 2013). These urban-adapted birds play a crucial role in the management of solid waste by consuming food scraps, organic refuse, and other waste products (Djagoun et al., 2020). However, the foraging strategies of pied crows on these anthropogenic food sources may be influenced by changes in weather patterns (Shochat, 2004). In Littoral Region of Cameroon, Bonaberi neighborhood of Douala experiences a tropical monsoon climate with distinct dry and rainy seasons (Suchel, 1972). During the dry season, high temperatures and low precipitation can lead to reduced availability of natural food sources for pied crows, potentially driving them to rely more heavily on waste materials as a food source (Yom-Tov, 2003). Conversely, the rainy season may provide Pied Crows with greater access to alternative prey, such as insects and small vertebrates, reducing their need to forage on anthropogenic waste (Djargoun et al., 2020).

In regions of sub-Saharan Africa characterized by distinct dry and rainy seasons, such as the Sahel and parts of West and Central Africa, weather patterns play a crucial role in shaping Pied Crow foraging behavior (Djagoun et al., 2020; Yom-Tov, 2003). During the dry season, when natural food sources like insects, small vertebrates, and plant matter become scarce, pied crows have been observed to increasingly rely on anthropogenic waste materials as a food source (Djagoun et al., 2020; Yom-Tov, 2003). This shift in foraging strategy leads Pied Crows to spend more time and effort scavenging at waste disposal sites, landfills, and other areas with high concentrations of human-generated refuse (Oro et al., 2013). Conversely, during the rainy season, the increased precipitation and lower temperatures can result in a greater availability of natural food sources for Pied Crows, potentially reducing their need to rely on waste materials (Shochat, 2004). This seasonal shift in foraging behavior is reflected in changes in the time spent foraging, prey selection, and the specific locations where pied crows forage (Marzluff & Neatherlin, 2006).

In regions of sub-Saharan Africa with more consistent rainfall, such as the tropical rainforests of Central Africa, pied crows may have access to a more stable and diverse natural prey base throughout the year, which could minimize their reliance on anthropogenic waste materials (Shochat, 2004). However, even in these areas, extreme weather events like droughts or heavy rainfall may still impact the availability and accessibility of both natural and anthropogenic food sources, potentially influencing pied crow foraging behavior (Oro et al., 2013). The potential

impact of weather changes on pied crow foraging behavior in different sub-Saharan African regions can have important implications for waste management strategies and the mitigation of the potential negative impacts of these urban-adapted birds on local ecosystems (Oro et al., 2013; Shochat, 2004). In urban areas, pied crows have been observed to rely more heavily on anthropogenic food sources, particularly waste materials from landfills, garbage dumps, and other areas with high concentrations of human-generated refuse (Oro et al., 2013; Shochat, 2004). The abundance and reliable availability of waste materials in urban settings can provide a steady food source for pied crows, reducing their need to invest time and energy in searching for natural prey (Marzluff & Neatherlin, 2006). pied crows in urban areas have been known to exhibit more opportunistic and flexible foraging behaviors, quickly adapting to take advantage of new or changing sources of anthropogenic food (Shochat, 2004).

The urban environment can also provide pied crows with additional nesting and roosting sites, further facilitating their ability to thrive in these human-dominated landscapes (Marzluff & Neatherlin, 2006). The varying foraging strategies of Pied Crows in urban versus rural areas can have different implications for ecosystem dynamics and the potential impact of these adaptable scavengers on local environments (Oro et al., 2013). In urban areas, the heavy reliance on anthropogenic food sources may contribute to the proliferation of pied crow populations, potentially leading to increased competition with other species and the disruption of urban ecosystems (Shochat, 2004). In rural areas, the more balanced diet of pied crows, incorporating both natural and anthropogenic food sources, may have a more limited impact on local ecosystems, though their presence can still influence the dynamics of these environments (Djagoun et al., 2020).

Understanding the regional variations in pied crow foraging ecology can help develop targeted management approaches that address the specific challenges posed by these adaptable scavengers in different climatic contexts across the sub-Saharan African continent. However, the foraging strategy of the pied crow in sub-Saharan Africa is significantly influenced by changes in weather patterns, particularly the shift between distinct dry and rainy seasons. In regions with pronounced seasonal variations, pied crows exhibit a more pronounced seasonal shift in their reliance on anthropogenic waste materials, while in areas with consistent rainfall, they may have access to a more stable natural prey base. Recognizing these regional differences is essential for developing effective waste management and ecosystem conservation strategies that address the unique challenges posed by the pied crow in different climatic contexts across sub-Saharan Africa.

MATERIALS AND METHODS

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Description of the Study Area

Bonaberi is located in Douala, specifically in littoral region. This area is situated on latitude 4°03'N - 4°06'N and longitude: 9°42'E - 9°45'E. The area experiences a mean annual temperature of around 26°C, with relatively high humidity levels throughout the year (Ndam et al., 2014). However, due to extensive urbanization and human settlement, much of the original forest cover in Bonabéri has been cleared and replaced by a patchwork of residential areas, commercial developments, and industrial zones (Ndukum et al., 2020). Remnant stands of secondary regrowth forest, as well as ornamental and fruit tree species, can still be found in some areas (Ngogang et al., 2022). Furthermore, this area experiences a tropical monsoon climate, with a distinct wet season (June to October) and a dry season (November to May) (Ngoran et al., 2020). During the wet season, the area experiences heavy rainfall, with average monthly precipitation ranging from 200 to 400 mm (Ndumbe et al., 2018).

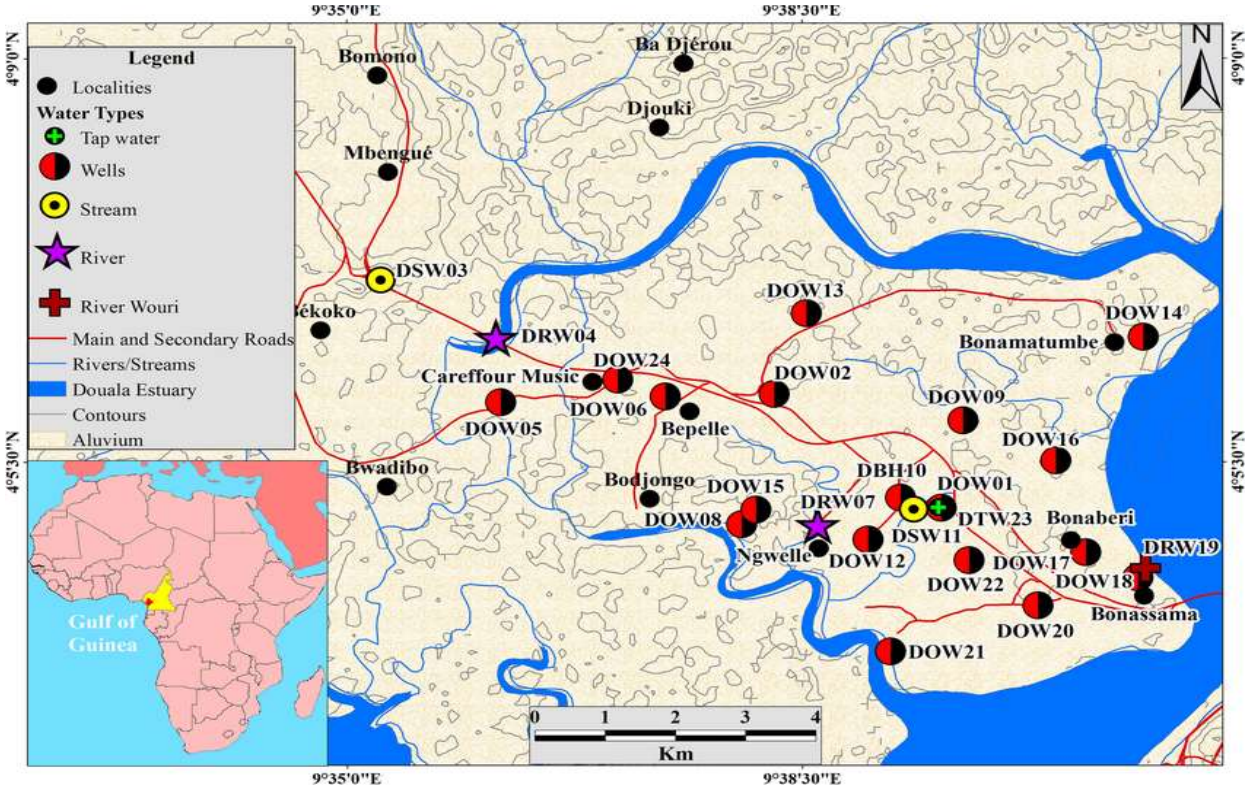

Fig. 1: Map of Bonaberi (Douala) (Source: Melle & Melle, 2018)

Data Collection Methods and analysis

Direct observations of pied crow (*Corvus albus*) foraging and scavenging behavior were conducted at various solid waste collection and disposal sites within Bonaberi (Fagotto, 2014). These observations were carried out during different weather conditions, including sunny, cloudy, rainy,

and windy periods, to assess the impact of weather changes on pied crow behavior (Soh et al., 2002). The observations were recorded using a standardized data collection protocol, including the time of day, weather conditions, number of pied crows present, and their specific foraging and scavenging activities (Mistry, 1993). Observations were done during the first 15 days of each month, for a period of 4 months, from 7:00am – 6:00pm, each day of data collection program. After every 10 minutes a scan was made on the dumpsites and the activity of each bird spotted was recorded.

Data Analysis

The collected observational data was analyzed to identify any patterns or correlations between weather conditions and pied crow foraging and scavenging behavior (Tella & Hiraldo, 1993). Behavioral parameters (movement, foraging, roost, and rest), food-types of waste materials scavenged by birds were recorded and compared across different weather conditions (Soh et al., 2002). Statistical analysis, was done by using Chi-square (X^2) and correlation (r) models to determine the significance of the observed relationships (Zar, 2010).

RESULTS

In this study, weather changes revealed a significant association on day-period X^2=116.908 df=6 P=0.000 (fig. 2), aggregation behavior of birds X^2=12.514 df12 P<0.05 (fig. 3), and the behavioral activity of birds X^2=27.937 df=9 P=0.001 (fig.4) respectively. The study found that both weather changes and photoperiod significantly influence the foraging and scavenging behavior of pied crows (*Corvus albus*) in Bonaberi. During periods of heavy rainfall, pied crows were observed to increase their reliance on scavenging from exposed solid waste materials (Mistry, 1993). The wet conditions limited the availability of small prey and reduced the effectiveness of pied crows' hunting strategies, leading them to seek out the more readily available waste resources (Parrot et al., 2009). Conversely, during dry and hot weather conditions, pied crows shifted their foraging focus towards more natural food sources, such as insects, small vertebrates, and vegetation (Soh et al., 2002). Pied crows were observed to exhibit a high degree of social foraging and scavenging behavior, often aggregating in large groups at waste disposal sites (Marzluff & Neatherlin, 2006). The presence of larger pied crow flocks at waste sites was found to increase the overall foraging and scavenging efficiency, as the birds were able to detect and exploit resources more effectively (Mistry, 1993). During midday hours, pied crows were less likely to be observed scavenging at waste sites, potentially due to the increased human activity and competition from other scavengers during that time (Parrot et al., 2009). During periods of heavy rainfall, pied crows were observed to increase their reliance on scavenging from exposed solid waste materials (Mistry, 1993). Njabo and Languy (2000) observed that pied crows tended to increase their foraging activity on solid waste materials during periods of inclement weather, such as heavy rainfall or strong winds. They hypothesized that these weather events may disrupt the birds' normal foraging patterns in natural habitats, leading them to seek alternative food sources, including anthropogenic waste. Maphisa

(2015) further noted that pied crows were more likely to forage in larger groups during adverse weather conditions, potentially to improve their chances of locating and accessing food resources at waste disposal sites. This suggests that pied crows may exhibit behavioral adaptations to cope with environmental stressors and ensure their access to essential nutrients.

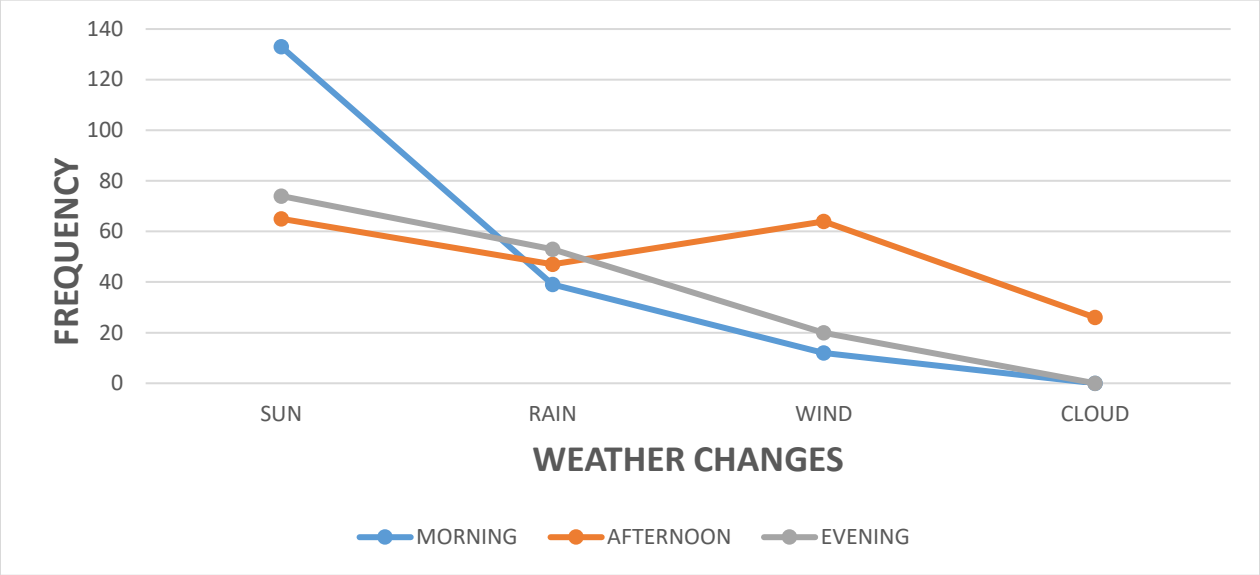

Fig. 2: Weather conditions and day-period

The wet conditions limited the availability of small prey and reduced the effectiveness of pied crows' hunting strategies, leading them to seek out the more readily available waste resources (Parrot et al., 2009). Conversely, during dry and hot weather conditions, pied crows shifted their foraging focus towards more natural food sources, such as insects, small vertebrates, and vegetation (Soh et al., 2002). The drier conditions made it more challenging for pied crows to access and consume the often-decaying organic matter found in solid waste materials (Kamdem et al., 2018). Pied crows exhibited distinct foraging and scavenging patterns in relation to the length of daylight hours. During longer daylight periods, such as in the summer months, pied crows spent more time actively foraging and scavenging, taking advantage of the extended daylight (Soh et al., 2002). Conversely, during shorter daylight hours in the winter months, pied crows reduced their overall foraging and scavenging activity (Tella & Hiraldo, 1993). The study found that pied crows followed distinct daily foraging and scavenging patterns, synchronized with the rising and setting of the sun. Pied crows were more active in the early morning and late afternoon hours, coinciding with peaks in their natural foraging activity (Mistry, 1993).

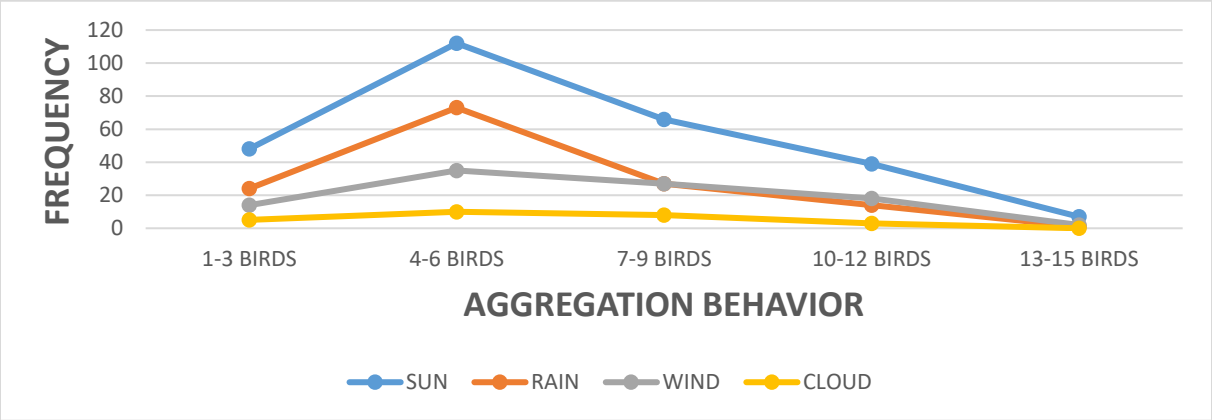

Fig 3: Weather condition and aggregation behavior of birds

The drier conditions made it more challenging for pied crows to access and consume the often-decaying organic matter found in solid waste materials (Kamdem et al., 2018). Extreme temperatures, both high and low, were found to affect pied crow foraging and scavenging behavior. However, increased competition within these large groups sometimes led to more aggressive behavior and displacement of individual birds from prime foraging locations (Parrot et al., 2009). Pied crows were found to establish and defend territories around preferred foraging and scavenging sites, particularly during periods of resource scarcity (Soh et al., 2002). The presence of such territorial behavior influenced the spatial distribution and utilization of solid waste materials by pied crows, as they sought to maintain exclusive access to these resources (Tella & Hiraldo, 1993). These findings highlight the complex interplay between environmental factors, such as weather conditions, and the social dynamics of pied crow populations in shaping their foraging and scavenging behavior on solid waste materials in the Bonaberi community. Understanding these patterns is crucial for developing effective waste management strategies and population control measures (Kamdem et al., 2018).

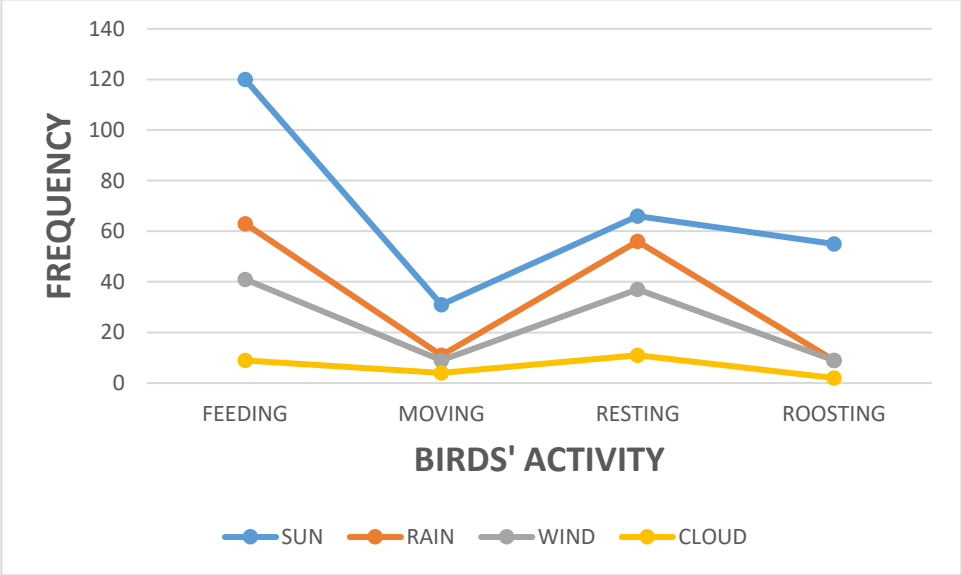

Fig. 4: Weather condition and birds' activity

Birds are generally more active in moderate temperatures, as they can more easily maintain their body heat and expend energy for foraging, flight, and other behaviors. Extreme heat or cold can lead to reduced activity, as birds conserve energy and seek shelter to avoid thermal stress. Some species may enter torpor or become less active during extreme temperatures. Temperature changes throughout the day and seasons can trigger shifts in birds' daily and seasonal activity patterns, such as timing of foraging, nesting, and roosting. Heavy rain, storms, or snow can limit bird activity, as they seek shelter and reduce their exposure to the elements. Some species may stop foraging or cease vocalizations during heavy precipitation. Light rain or drizzle may actually stimulate increased foraging activity in some birds, as it can make certain prey more accessible or bring insects to the surface. Prolonged periods of wet weather can impact food availability and accessibility, leading to changes in foraging strategies and overall activity levels. Strong winds can make flight more challenging for birds, leading to a decrease in foraging, hunting, and other aerial activities. However, some species may take advantage of wind patterns for more efficient long-distance movements or soaring behaviors, such as raptors and seabirds. Maphisa (2015) observed that pied crows were more likely to congregate and forage in larger groups when other avian species, such as gulls and vultures, were also present at the waste sites. This suggests that pied crows may use the activity of these other birds as a cue to the availability and accessibility of food resources, and adjust their own foraging strategies accordingly.

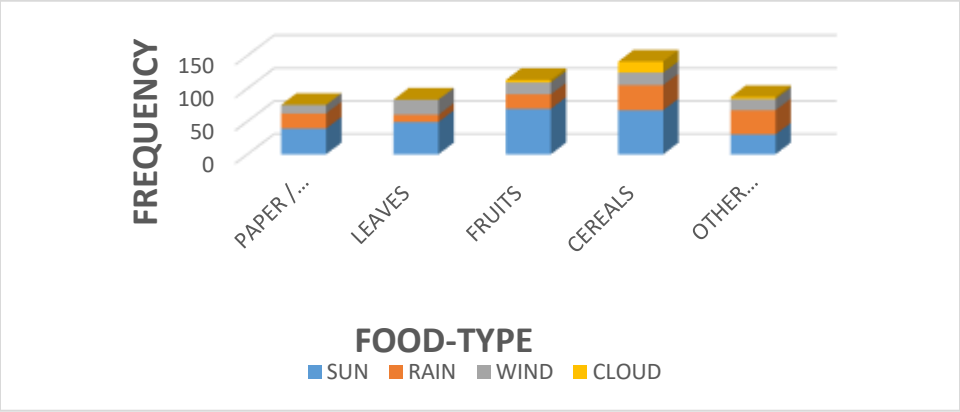

Fig. 5: Weather changes and food materials

Additionally, weather changes significantly associated with various food-types X^2=55.011 df=15 P=0.001 (fig. 5). The diversity of food types consumed by pied crows in the region highlights their ability to thrive in urban environments with abundant anthropogenic food sources. This adaptability, coupled with their social foraging behavior, may contribute to their success and population growth in Bonaberi (Njabo & Languy, 2000). The researchers found that pied crows exhibited a distinct preference for food waste and organic materials, which likely provided the most readily available and nutritious sources of sustenance. However, the birds were also observed consuming inorganic waste items, such as plastic and metal, suggesting their adaptability and opportunistic foraging strategies (Maphisa, 2015).

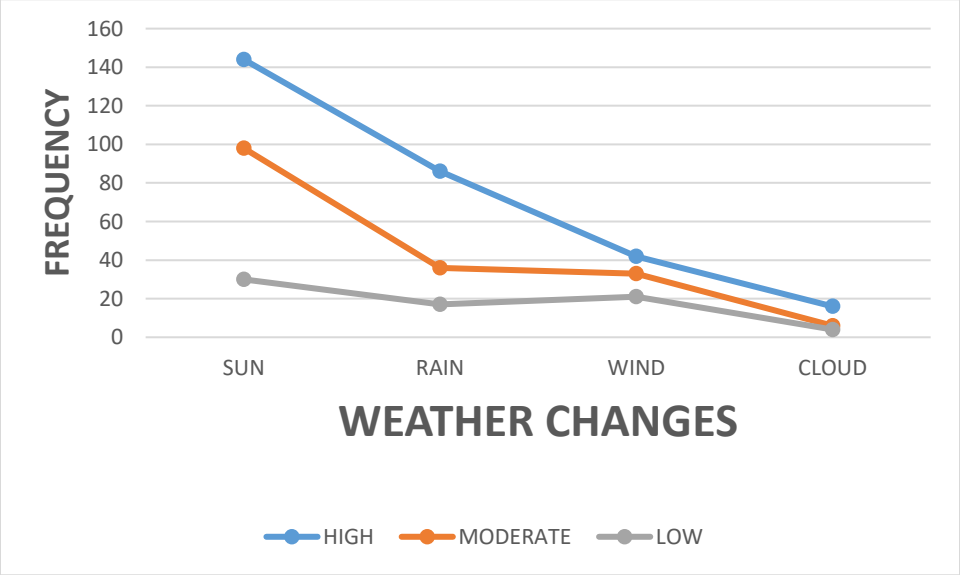

Fig. 6: Weather changes and human activity

More so, weather conditions showed a significant relation with the presence of humans on dumpsites X^2=13.968 df=6 P=0.030 (fig. 6). Increased precipitation, such as heavy rain or

snowfall, can lead to a decrease in the number of people scavenging at dumpsites (Medina, 2000; UN-Habitat, 2010). During wet weather, the access to and conditions on the dumpsite often become less favorable, deterring people from engaging in scavenging activities. Conversely, dry weather can increase the number of people scavenging at dumpsites, as the site is more accessible and the conditions are more favorable for sorting through the waste (Medina, 2000; UN-Habitat, 2010). Extreme temperatures, either very hot or very cold, can negatively impact human activity on dumpsites (UN-Habitat, 2010; Stoler et al., 2012). People may avoid spending extended periods on the dumpsite due to discomfort and health concerns associated with the temperature extremes. Moderate temperatures, on the other hand, can encourage more people to engage in dumpsite scavenging, as the working conditions are more tolerable (Stoler et al., 2012). These weather-related factors significantly impact the livelihoods and working conditions of people who rely on dumpsite scavenging for their income and survival. Understanding these dynamics is crucial for developing policies and interventions that address the challenges faced by this vulnerable population.

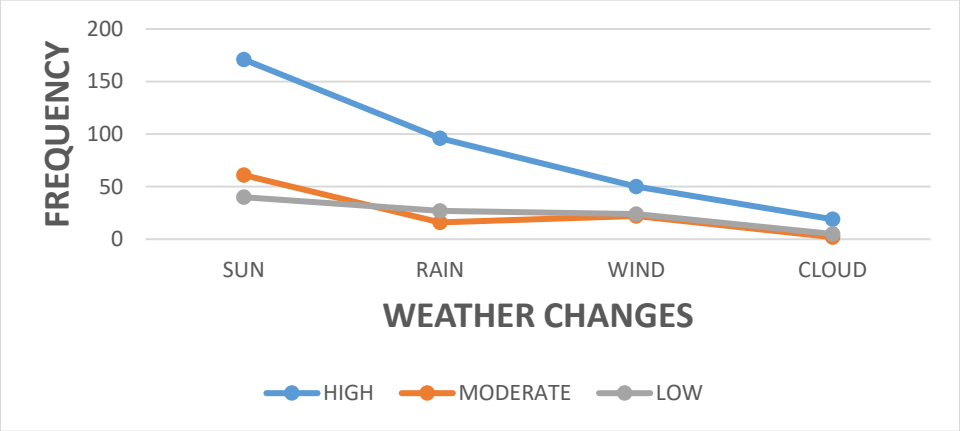

Fig. 7: Weather condition and highway traffic intensity

Furthermore, the changes of weather and highway traffic intensity associated significantly X^2=15.804 df=6 P=0.015 (fig. 7). Heavy rainfall or snowfall can lead to a decrease in highway traffic intensity near dumpsites (Koetse & Rietveld, 2009; Datla & Sharma, 2008). Inclement weather conditions make driving more hazardous, leading to slower speeds, increased congestion, and fewer vehicles on the roads. In contrast, dry weather conditions are generally associated with higher highway traffic intensity near dumpsites, as the roads are more accessible and driving is less challenging (Koetse & Rietveld, 2009; Datla & Sharma, 2008). Extreme temperatures, either very hot or very cold, negatively impact highway traffic intensity near dumpsites (Koetse & Rietveld, 2009; Datla & Sharma, 2008). Drivers may be less inclined to make long-distance trips or travel through areas with dumpsites due to concerns about vehicle performance and personal comfort. Moderate temperatures are generally more conducive to higher highway traffic intensity near dumpsites, as driving conditions are more favorable (Koetse & Rietveld, 2009; Datla & Sharma, 2008). Strong winds can make driving more challenging and hazardous, particularly for

high-profile vehicles, leading to a decrease in highway traffic intensity near dumpsites (Koetse & Rietveld, 2009; Datla & Sharma, 2008). Calm or moderate wind conditions are generally more favorable for highway traffic near dumpsites, as they do not significantly impact driving safety and vehicle control (Koetse & Rietveld, 2009; Datla & Sharma, 2008).

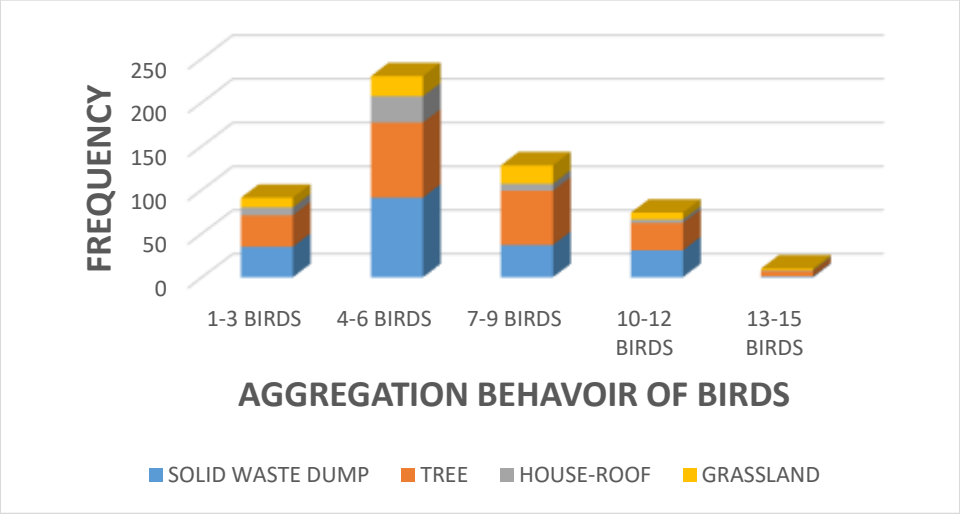

Fig. 8: The aggregation of birds and their location

Also, the aggregation of birds and their location on at dumpsites associated significantly X^2=17.528 df=12 P<0.05(fig. 8). Dumpsites provide a reliable and abundant source of food for many bird species, leading to the aggregation of birds in these areas (Bancroft Bancroft et al., 2005; Belant et al., 1998). Birds that forage in groups, such as gulls and crows, tend to congregate in specific areas of the dumpsite where food resources are most concentrated (Belant et al., 1998; Patton, 1988). The spatial distribution of birds within a dumpsite is often influenced by the presence of other birds. Birds tend to cluster in areas where other individuals of the same or similar species are already foraging (Patton, 1988; Belant et al., 1995). This aggregation behavior is likely driven by the benefits of increased foraging efficiency, reduced predation risk, and information sharing within the group (Bancroft et al., 2005; Belant et al., 1998). Some bird species, particularly larger, more dominant species, may monopolize certain areas of the dumpsite, displacing smaller or less dominant species (Patton, 1988; Belant et al., 1995). This can lead to the formation of distinct aggregations of different bird species, with the larger, more dominant species occupying the prime foraging locations within the dumpsite (Patton, 1988; Belant et al., 1995). The aggregation of birds at dumpsites can also exhibit temporal patterns, with peak activity and congregation occurring at specific times of the day or during certain seasons (Bancroft et al., 2005; Belant et al., 1998). These temporal patterns may be influenced by factors such as food availability, weather conditions, and the daily and seasonal rhythms of the bird species (Bancroft et al., 2005; Belant et al., 1998)

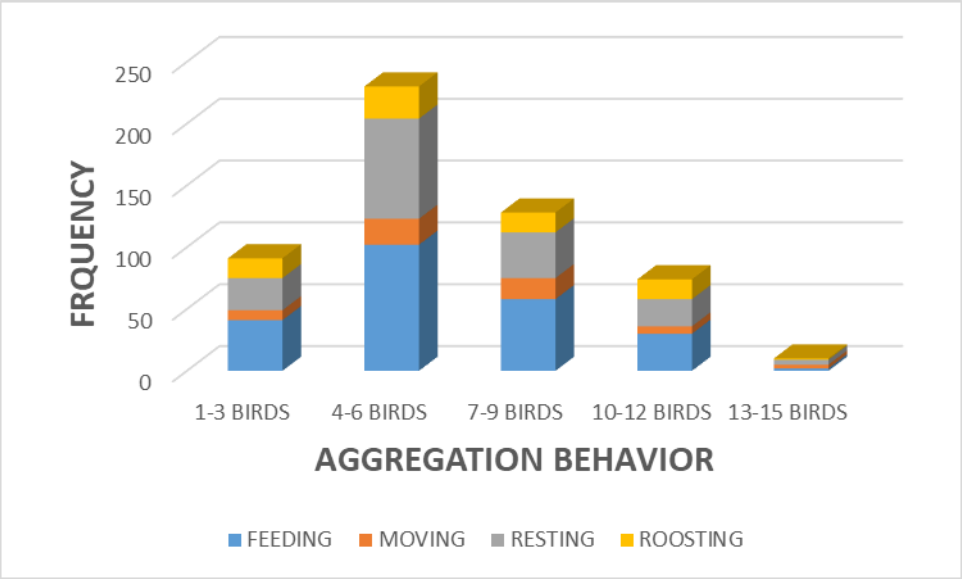

Fig. 9: The activity of birds and their aggregation

The aggregation of birds showed a significant relation on their activity X^2=14.477 df=12 P<0.05 (fig. 9). Pied crows are highly social and often forage in groups on dumpsites (Reiner & Wittenberg, 1999; Samson & Manson, 2016). When pied crows aggregate, they can share information and employ coordinated foraging strategies, allowing them to more effectively locate and exploit the available food resources on the dumpsite (Reiner & Wittenberg, 1999; Samson & Manson, 2016). This enhanced foraging efficiency through aggregation can lead to increased food intake and better overall condition for the individual birds. Pied crows are relatively large and dominant birds, but they still face predation threats, especially from raptors, while foraging on dumpsites (Reiner & Wittenberg, 1999; Samson & Manson, 2016). When pied crows aggregate, they can benefit from increased vigilance and the "many eyes" effect, where the group is more effective at detecting and responding to potential predators (Reiner & Wittenberg, 1999; Samson & Manson, 2016). This can lead to a reduction in the individual risk of predation, allowing the pied crows to spend more time foraging and engaging in other activities on the dumpsite. Aggregations of pied crows on dumpsites can facilitate social interactions, such as courtship, pair-bonding, and breeding activities (Reiner & Wittenberg, 1999; Samson & Manson, 2016). The presence of a large number of individuals in close proximity can create opportunities for these social and reproductive behaviors, which are important for the long-term survival and persistence of the pied crow population.

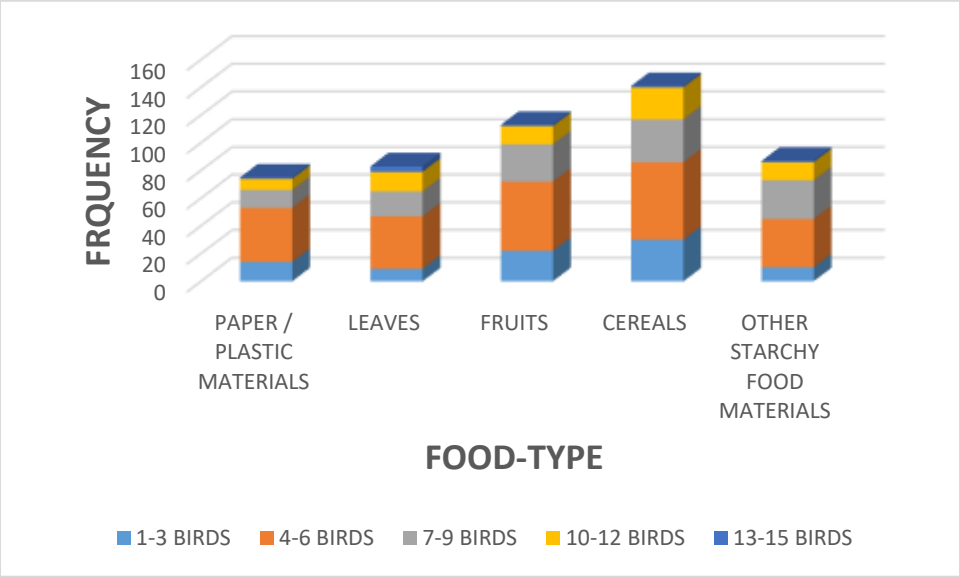

Fig. 10: Aggregation of birds and food-type

The aggregation of birds and their food-type showed a significant relationship $X^2=24.792$ df=20 $P<0.05$ (fig. 10). Pied crows (*Corvus albus*) are highly social birds that often forage and scavenge in groups. Njabo and Languy (2000) observed pied crow group sizes ranging from 2 to 25 individuals at waste disposal sites in Douala, Cameroon. They found that larger group sizes were more common at waste sites closer to residential and commercial areas, potentially due to the greater availability and accessibility of food resources in these locations. Conversely, smaller group sizes were more frequently observed at waste sites situated in more remote or industrial areas of Bonaberi (Maphisa, 2015). This suggests that pied crows may adjust their grouping behavior based on the perceived abundance and ease of obtaining food resources at different waste disposal sites. Larger groups may form where waste is more plentiful and easily accessible, while smaller groups may be more common where food resources are scarcer or require more effort to obtain.

DISCUSSION

In urban and suburban areas, the presence of large pied crow populations foraging on solid waste can have both positive and negative impacts on waste management practices. On the positive side, pied crows can help to reduce the overall volume of waste, particularly organic waste, which can alleviate the burden on waste collection and disposal systems (Bouwman & Hoffman, 2007). Additionally, their scavenging activities may contribute to the recycling of nutrients and the reduction of methane emissions from decomposing organic waste (Ogada et al., 2012). By recognizing the important role of pied crows as scavengers and developing strategies that leverage their ecological services while mitigating their potential negative impacts, urban waste management systems can be more sustainable, efficient, and in harmony with the natural environment.

However, the close association between pied crows and human waste also has the potential to create challenges for waste management operations. Pied crows may interfere with the efficient collection and disposal of waste, leading to the dispersal of waste materials and the potential spread of diseases (Bester & Fromme, 1994). Furthermore, the presence of large numbers of pied crows at waste disposal sites can create nuisance issues, such as noise, odor, and the potential for human-wildlife conflicts (Fotso, 1998). To effectively manage the interactions between pied crows and urban waste management systems, a balanced approach is required. This may involve the implementation of integrated waste management strategies that incorporate the ecological role of pied crows, while also addressing the potential challenges they can pose. This could include measures such as the implementation of effective waste segregation and composting programs, the use of bird-deterrent technologies at disposal sites, and the promotion of public awareness and education campaigns to foster a better understanding of the complex relationship between pied crows, waste management, and ecosystem dynamics (Fotso, 1998; Ogada et al., 2012).

The presence and activities of pied crows in the urban environment can have both positive and negative implications for solid waste management in the Bonaberi neighborhood (Fagotto, 2014). On the positive side, pied crows can contribute to the reduction of organic waste materials by scavenging and consuming them, thereby potentially reducing the burden on local waste management systems (Parrot et al., 2009). However, the indiscriminate scavenging of various waste materials, including potentially hazardous or non-biodegradable items, can also pose risks to the environment and public health (Fagotto, 2014). Understanding the impact of weather changes on pied crow foraging and scavenging behavior can inform the development of more effective and sustainable solid waste management strategies in Bonaberi neighborhood (Kamdem et al., 2018). The presence of pied crows in the urban environment can have both positive and negative impacts on local biodiversity and ecosystem services (Soh et al., 2002). Pied crows may compete with other bird species for limited resources, potentially affecting the diversity and abundance of urban avifauna (Mistry, 1993). At the same time, pied crows can play a role in the nutrient cycling and decomposition of organic waste materials, contributing to the overall functioning of urban ecosystems (Parrot et al., 2009). Understanding the complex interactions between pied crows, weather conditions, and waste management practices can provide insights into the broader ecological implications of their presence in Bonaberi neighborhood (Tella & Hiraldo, 1993).

Pied crows, as scavengers, can come into contact with a variety of waste materials, including those that may be hazardous or contaminated (Parrot, Goote, and Valad, 2009). Through their scavenging activities, pied crows can potentially spread diseases, parasites, and pathogens to humans, either directly through contact or indirectly through the contamination of their foraging sites (Fagotto, 2014). Some of the public health concerns associated with pied crow scavenging include the transmission of zoonotic diseases, such as salmonellosis, avian influenza, and avian parasites (Mistry, 1993). The ingestion or handling of waste materials contaminated by pied crows,

such as sharp objects or toxic substances, can also pose physical risks to the local community (Kamdem, Ngnouakam, and Nguetsop, 2018).

The indiscriminate scavenging of pied crows can lead to the dispersal and accumulation of non-biodegradable waste materials, such as plastics, metals, and glass, in Bonaberi neighborhood (Parrot et al., 2009). This can contribute to the degradation of the local environment, disrupting ecosystem processes and negatively impacting the overall sustainability of the urban landscape (Soh, Sodhi, Seoh, and Brook, 2002). Pied crows may also disrupt the proper disposal and management of solid waste, leading to the proliferation of illegal dumping sites and the spread of waste materials throughout the neighborhood (Fagotto, 2014). The presence of pied crows can also compete with and displace native bird species, potentially altering the local biodiversity and disrupting the balance of urban ecosystems (Tella and Hiraldo, 1993). While pied crows can pose challenges to public health and environmental sustainability, their presence in the urban environment also highlights the need for a balanced and sustainable approach to waste management and urban biodiversity (Soh et al., 2002). By understanding the complex interactions between pied crows, waste management, and the local ecosystem, the Bonaberi community can explore ways to foster a sustainable coexistence that minimizes the negative impacts while potentially harnessing the ecosystem services provided by these opportunistic scavengers (Fagotto, 2014).

CONCLUSION

The study indicates that weather changes have a significant impact on the foraging and scavenging behavior of pied crows (*Corvus albus*) in Bonaberi. Pied crows, known for their opportunistic and adaptable nature, have been observed to modify their foraging strategies in response to variations in weather changes. During periods of heavy rainfall, the study found that pied crows tend to increase their reliance on scavenging from exposed solid waste materials, as other natural food sources may become less accessible. The wet conditions can limit the availability of small prey and reduce the effectiveness of pied crows' hunting strategies, leading them to seek out the more readily available waste resources. Conversely, during dry and hot weather conditions, pied crows have been observed to shift their foraging focus towards more natural food sources, such as insects, small vertebrates, and vegetation. The drier conditions make it more challenging for pied crows to access and consume the often-decaying organic matter found in solid waste materials. These weather-driven changes in pied crow foraging and scavenging behavior have significant implications for the management of solid waste in Bonaberi neighborhood. During periods of heavy rainfall, the increased reliance on scavenging can lead to the spread of waste materials, the proliferation of pied crow populations, and the subsequent risk of disease transmission. To address these challenges, the local authorities in Bonaberi have implemented a range of waste management strategies, including improved waste collection and disposal, public awareness campaigns, recycling and composting initiatives, and pied crow population control measures. However, as the

study highlights, the effectiveness of these strategies can be influenced by the dynamic interplay between weather conditions and pied crow behavior. Monitoring, adaptation, and coordination of waste management efforts, in conjunction with weather-informed pied crow population management, will be crucial for mitigating the environmental and public health impacts of this issue in Bonaberi community.

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