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Mortality of large macaws by electrocution in an urban area, Campo Grande, Mato Grosso do Sul, Brazil

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Abstract: Electrocution is a theme that has been rarely reported for large macaws. The objective of this study was to analyze mortality of macaws due to electrocution in an urban area of Campo Grande, Mato Grosso do Sul. Between 2011 and 2020, 59 macaws were registered as having died through electrocution, and these were from two species: ***Ara ararauna*** (Linnaeus, 1758) and ***Ara chloropterus*** (Gray, 1859). ***A. ararauna*** had the largest number of deaths registered (48), and A. chloropterus had 11 individuals. Electrocution was shown to be an important factor for the loss of large macaws in this urban environment. Body size, wingspan, and behavior of the macaws, as well as location and proximity of food resources and nests to electrical structures, were shown to increase the probability of electrocution. These results demonstrate the need to develop mitigation measures to reconcile the sustainable development of a medium-sized city such as Campo Grande with biodiversity conservation.

Keywords: Psittacidae; Urban Ecology; Electrical Networks; Conservation.

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Introduction

Urbanization is considered one of the principal factors related to habitat alteration and loss of biodiversity. However, some cities have a large diversity of habitat composed of constructed environments mixed with green areas, which enables maintenance of a diverse bird community. This reduces the negative impacts caused by urbanization and maintains importants ecosystems services such as pollination, seed dispersion, and improvement of the quality of life of the human population (BRUN et al., 2007; EVANS et al., 2009; GUEDES, 2012; SCDB, 2012; ANGEOLETTO et al., 2015; TRYJANOWSKI et al., 2015; PENA et al., 2017).

Studies have recently been conducted on fauna being run over by vehicles, attacked by domestic animals, colliding with buildings, and accidents caused by kite strings made from a sharp material that can cut, among other factors, that cause negative impacts on fauna present in urban, agricultural, and degraded forest environments (BÁGER et al., 2016; BRISQUE et al., 2017; FERREIRA; GENARO, 2017; HOLDERNESS-RODDAM; MCQUILLAN, 2014; ROY; SHASTRI, 2013). Among these, electrocution caused by electric energy distribution networks stands out (CHEVALLIER et al., 2015; GODINO et al., 2016).

Electric energy distribution lines can cause a large diversity of impacts on biodiversity, such as fragmentation and habitat modification during its installation. These energy distribution lines also cause noise pollution and increase the probability of wildfires besides the effects of their direct interaction with fauna (LEHMAN et al., 2007; APLIC, 2006, 2012; FERRER, 2012; PEREZ-GÁRCIA et al., 2011).

Accidents involving energy distribution lines have caused mortality of a large diversity of wild animal species. Most of these individuals end up dying, but those that survive end up living with irreversible injuries which prevent their survival in natural environments (SCHAUB et al., 2010; APLIC, 2012; BUSS et al., 2015; CHEVALLIER et al., 2015; SOUZA et al., 2017).

Birds are the animal group that is most affected by accidents with energy distribution lines because many species use structures such as electric lines and posts as places to perch, hunt from, and nest. Most of the affected individuals collide with these structures in their habitats (GUIL et al., 2011; FERRER, 2012; PEREZ-GÁRCIA et al., 2011; BURGIO et al., 2014; RED et al., 2014). Mortality of young and adult birds by electrocution can decrease reproductive success and therefore reduce the growth and viability of bird populations. It is therefore important to understand the dynamics of these accidents to minimize their impacts on urban bird species (HUNT, 2002; HUNT; HUNT, 2006; DREWITT; LANGSTON, 2008; SCHAUB et al., 2010; CHEVALLIER et al., 2015; GODINO et al., 2016).

Electrocution principally occurs as a result of direct contact of individuals with the structures that make up the energy distribution network (SCHAUB et al., 2010; CHEVALLIER et al., 2015). In general, birds enter into contact with these structures when they fly between places where they rest, forage, or nest (LEHMAN et al., 2007; BURGIO et al., 2014; RED et al., 2014; CHEVALLIER et al., 2015; GODINO et al., 2016). Additionally, previous studies have related that environmental factors as well as behavioral ones can increase the risk of electrocution, such as the location of the energy distribution network, climate conditions, feeding habits, wingspan, and length and weight of individuals (JANSS, 2000; BURGIO et al., 2014; CHEVALLIER et al., 2015; SOUZA et al., 2017).

Studies on the impacts of electrocution on populations of species in the family Psittacidae have not been published, but there have been unpublished reports of the occurrence of this type of accident. Golmes et al. (2018), studying electrocution rates in birds in Argentina, related that mortality of small Parrots (*Cyanoliseus pataganus* and *Myopsitta monachus*), represented about 50% of the total of individuals killed by electrocution. The authors considered electrocution to be an important factor in the mortality of individuals of these species in the study area and suggested that death by electrocution be evaluated in other regions where Psittacidae occur, especially those that are threatened with extinction. However, no studies were found in the literature that analyzed electrocution of populations of large macaws, and there was just one mention of Blue-and-yellow macaws (*Ara ararauna* Linnaeus, 1758 - Psittacidae) that were received at the Wild Animal Rehabilitation Center of Mato Grosso do Sul (CRAS/MS) between 2004 and 2009 that had suffered electrocution (GUEDES, 2012).

In this context, the objective of this study was to analyze and quantify the mortality of macaws due to electrocution in an urban area of Campo Grande, Mato Grosso do Sul between 2011 and 2020.

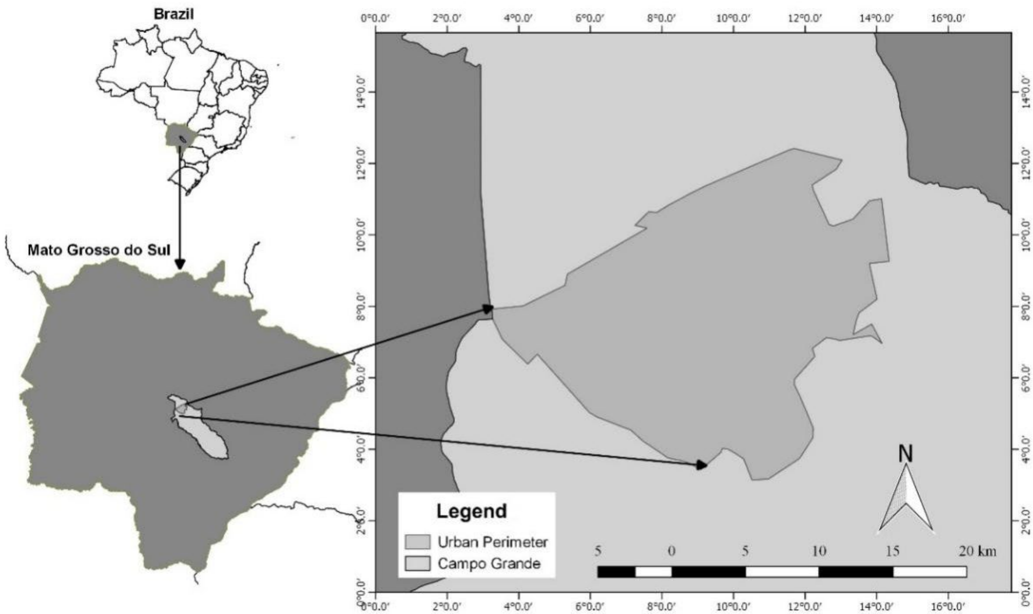
Material and Methods

Study area

The municipality of Campo Grande is located between coordinates 20º26’37” latitude South and 54º38’52” longitude West and is surrounded by six other municipalities. The total area of the municipality is 8,092.95 km^2, where 359.03 km^2 represent the urban area (Figure 1) (PLANURB, 2016).

According to the Köppen classification, the climate of Campo Grande is between the humid mesothermic subtype with no dry season (Cfa) and the tropical humid subtype (Aw). The driest part of the year is between July and August, and the rainy season is between October and April (PLANURB, 2016).

Figure 1 – Location of the municipality of Campo Grande, State of Mato Grosso do Sul, Brazil. The perimeter that delimits the urban area of Campo Grande is highlighted



Source: The authors

Data collection

This research is part of the Urban Birds Project—Macaws in the City (Projeto Aves Urbanas – Araras na Cidade), which is organized by the Arara Azul Institute (ITA). The project monitors large macaws (*A. ararauna* and *Ara chloropterus* - Gray, 1859) in urban areas of Campo Grande. The nests and juveniles of individuals of *A. ararauna* that nest in urban areas were monitored. All juveniles of *A. ararauna* monitored by the project received a stainless-steel ring (individual identification ring) before they abandoned the nests, which allows for identification of these young after leaving the nest.

The species *A. chloropterus* does not reproduce in the city and is present only during the first semester of the year when it searches for food sources; the project monitors this species during this period.

A. ararauna has a wide geographic distribution and occurs from the south of Central America to the Central region of Brazil, and is found in the states of Rondônia, Roraima, Amazonas, Pará, Mato Grosso, Mato Grosso do Sul, Tocantins, Minas Gerais, Bahia, Piauí, São Paulo and Paraná (GWYNNE et al., 2010; GUEDES, 2012). This species, when adult, measures between 81 and 86 cm and weighs between 900 and 1200 grams

(GWYNNE et al., 2010; GUEDES, 2012).

During recent years, *A. ararauna* has been registered in urban areas of Brazilian cities (FRANCHIN; MARÇAL-JÚNIOR, 2009; FRANCO; PRADO, 2012). In the urban area of Campo Grande, this species arrived at the end of the previous century and established itself as a resident which could be easily observed feeding on fruits in trees and making nests throughout the city (GUEDES, 2012).

Ara chloropterus also occurs in Central and South America, including Panama, Colombia, Ecuador, Peru, Bolivia, and Paraguay (GUEDES, 2012). In Brazil, this species occurs in the Amazon region, and in the states of Piauí, Bahia, Mato Grosso do Sul, Mato Grosso, Goiás, Minas Gerais, São Paulo, Rio de Janeiro, Espírito Santo, and Paraná (GWYNNE et al., 2010; GUEDES, 2012). This species is observed in Campo Grande between January and June in feeding places, and starting in July, it returns to rural areas for reproduction (GUEDES, 2012). Furthermore, this is a large species, which measures between 89 and 96 cm in length and weighs between 1,050 and 1,400 grams (GWYNNE et al., 2010; GUEDES, 2012).

Instances of mortality of juvenile and adult individuals of the species *A. ararauna* and *A. chloropterus* were recorded for 10 years (2011 to 2020) in the urban area of Campo Grande, Mato Grosso do Sul.

During this period, this research project was widely publicized in local and online social media, which promoted knowledge and support of this and other projects of the Institute among nearby residents. Therefore, the data were obtained not only by the researchers but also through the efforts of citizens who contacted the Institute by calling or through social media.

When it was possible, citizens who reported these events also collected the animal involved in the accident and delivered it to workers at the Institute, who subsequently conducted a necropsy to identify the sex and the cause of death. Additionally, a total of two cases of electrocution of macaws were added to the database from reports published in local newspapers.

For each electrocuted macaw, the date, place, and activity of the animal at the time of electrocution (for example, flying, defending a nest, foraging), species, age (juvenile or adult), and presence or absence of a tracking ring. Animal activity was determined after a technical analysis of the accident area and from information furnished by local residents who observed the accident. The geographic coordinates were recorded, and these points were plotted using the software Quantum Gis, version 2.14, and were used to detect the region with the highest frequency of accidents (Figure 2).

Data analysis

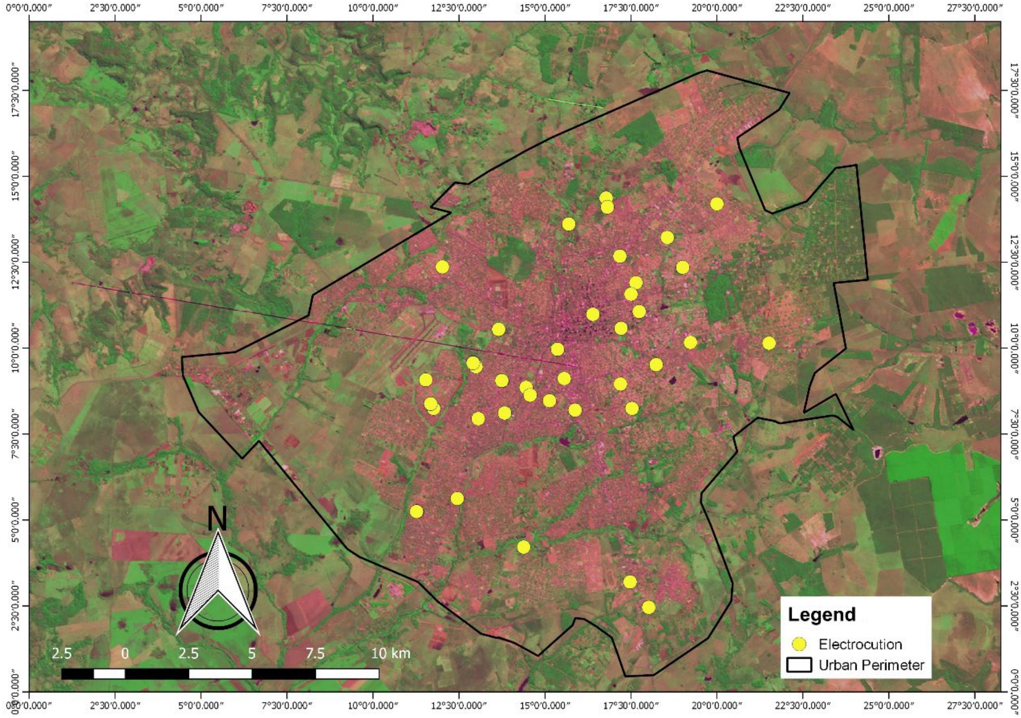
The count results were presented as absolute values and as proportions (%). A *t*-test was used to test for differences in the number of *A. ararauna* and *A. chloropterus* electrocuted during the study period. The *Qui-square* test (χ^2) with residual analysis was used to identify significant differences with respect to the number of macaws during different seasons of the year and the activity engaged in at the time of electrocution, and if age and sex influenced the electrocution events. All analyses were done using BIOESTAT 5.0 (AYRES et al., 2007) with a significance level of $p<0.05$.

Results and Discussion

During the study a total of 59 macaws were killed by electrocution in the urban area of Campo Grande (Figure 2). Forty-eight of these were the species blue-and-yellow macaw (*A. ararauna*), and 11 were red-and-green macaw (*A. chloropterus*), which represents 81.4% and 18.6% of the registered cases, respectively ($t= 2.82$; $p= 0.03$). This difference in the number of macaws electrocuted between species is related to population size since *A. ararauna* was estimated as having about 700 individuals, and *A. chloropterus* did not have a solid estimate, but during a six-month period 27 specimens were sighted. Besides population size, differences in behavior and use of the environment by the two species contributed to the larger number of deaths by electrocution of *A. ararauna* since this species resides in the city during the entire year, whereas *A. chloropterus* is only present during part of the year.

Raptor species are those that are most similar to large macaws and are the most studied with respect to accidents with electric energy distribution lines (LEHMAN et al., 2007; SCHAUB et al., 2010; GUEDES, 2012; CHEVALLIER et al., 2015). Among the similarities are body size and wingspan, and this allows for certain comparisons. In this context, for both groups, the probability of electrocution is associated with these two factors, coupled with dense populations. However, in the case of the Psittacidae, death by electrocution has rarely been reported in the literature, and those that do exist relate accidents involving smaller species, such as parrots and parakeets (APLIC, 2006; GOLMES et al., 2018).

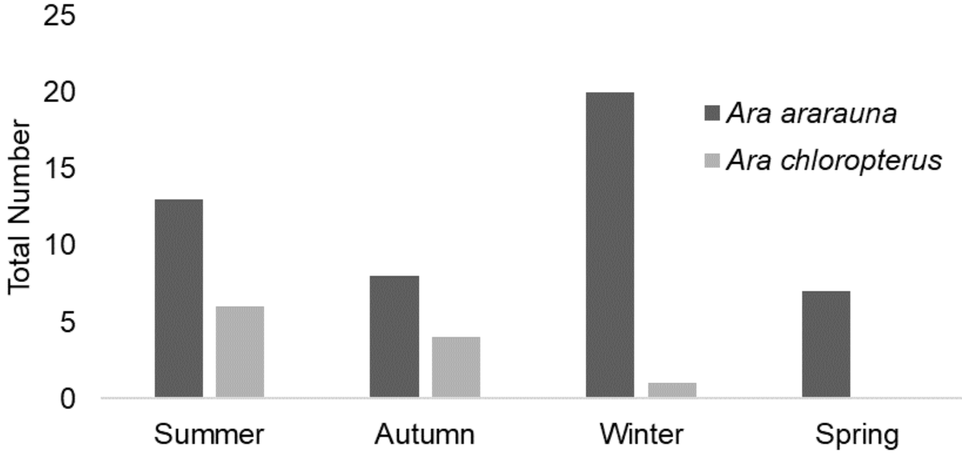
Figure 2 – Satellite image delimiting (solid line) the urban area of Campo Grande. The yellow dots represent electrocution accident sites involving large macaws (*A. ararauna* and *A. chloropterus*) between 2011 and 2020.



Source: The authors.

Seasonal variation between the two species was significant ($\chi^2 = 8.07$; $p = 0.04$) and residual analysis revealed that only in the winter were these values significant. *A. ararauna* had the largest number of deaths by electrocution in the winter (n=20), which is the beginning of the reproductive phase of this species. The second highest number of deaths registered for *A. ararauna* was during the summer (n=13), the period when juveniles are leaving their nests. In the autumn (n=8) and spring (n=7), the data were similar, and this is the period when couples are exploring and improving their nesting cavities and when offspring are born and developing. *A. chloropterus* had its highest number of deaths by electrocution in the autumn and summer (n=10), the period when they are in the city in search of food sources (Figure 3).

Figure 3 – Deaths by electrocution of *A. ararauna* and *A. chloropterus* during the four seasons of the year (summer, autumn, winter, and spring) in the urban area of Campo Grande, Mato Grosso do Sul



Source: The authors.

The presence of macaws in the study area began to be studied at the end of the decade of the 1990s after fires and deforestation occurred near the urban area (GUEDES, 2012). Campo Grande has a high density of trees throughout the urban area, such as fruit trees and palms that were planted as part of landscape design, and these offer food and nesting sites to *A. ararauna*, which has become a resident in the city. In contrast, *A. chloropterus* only occurs seasonally in the city, and the availability of food is a determining factor for its occurrence between summer and winter. Therefore, the availability of food together with nesting availability are factors that influence the occurrence of these two species (GUEDES, 2012).

According to several authors, electrocution accidents increase during certain seasons of the year due to rainfall and the phases of reproduction, migration, and dispersion of juveniles (GARRIDO et al., 2009; VALVERDE et al., 2010; SOUZA et al., 2017). Seasonality was also reported in a study done by Golmes et al. (2018) examining raptors in Argentina, where electrocutions were greater during autumn and winter than in spring and summer. In this case, electrocutions were related to migration and the behavior of some species which increased the chances of electrocution.

There was a significant difference in the number of electrocutions related to activity type (χ^2=39.6; p= 0.000). In the case of *A. ararauna* electrocution varied according to movement between usage areas (41.7%), perching on electrical conductors or other structures of the electrical energy distribution network such as crossarms on posts (20.8%), during feeding (8.3%), nest defense (4.2%) and during the first flight attempt by juveniles

(2.1%). In 22.9% of the incidents, bird activity was not identified at the moment of the accident. For *A. chloropterus*, accidents with the electrical energy distribution network were the only cause of death of adults of this species (n=11), and 100% of these occurred during feeding (Figure 4B). In Campo Grande, during the period when individuals of *A. chloropterus* are in the city, it is common to observe them feeding on the native and exotic species that are present, especially on the seeds of *Terminalia catappa* L. and *Inga laurina* (Sw). It was observed that the trees that were planted along the urban avenues were in constant conflict with the electrical energy lines. The branches of these trees grow and reach the energy lines, and these remain hidden in the middle of the vegetation. This way, during foraging or perching, birds end up touching parts of these structures that are not electrically isolated and receive an electrical discharge (Figure 4B). In Campo Grande, Mato Grosso do Sul, a large part of the structure of the electrical energy distribution network is not isolated. This fact, coupled with the behavior of large macaws in the urban environment, increases the chances of electrocution.

Of the 48 individuals of *A. ararauna* that died**,** 56.2% (n=27) were adults, 35.4% (n=17) were young, and 8.3% (n=4) were of an undetermined age (χ^2= 7.47; p= 0.023). Of the young individuals, 88.2% had tracking rings, as did 25.9% of the adults. The majority (89.6%) of the macaws died when they touched their wings to the electric lines or perched on uninsulated structures such as crossbars, 8.3% died when colliding with the energy transformer, and for 2.1% of them it was not possible to determine with which structure the animal had made contact. Sex was determined for 22 individuals of *A. ararauna*, which had 14 female and 8 male specimens (χ^2= 1.23; p= 0.59). It is important to emphasize that adult individuals were in the reproductive phase and their deaths resulted in the deaths of eggs and offspring. The injuries caused by these accidents ranged from light, external lesions, without burns or with severe burns (Figure 4A) and hemorrhage.

Nests of *A. ararauna*, were located across a large diversity of urban spaces including backyards, sidewalks, construction structures along avenues, and commercial buildings, among others. These nesting sites were in constant proximity to the energy distribution lines and represent an increased risk of electrocution accidents (Figure 5A). The fact that nests were often near energy posts facilitated perching of these birds on them, and thus increased risk of electrocution (Figure 5B).

Figure 4 – Images of electrocuted macaws: (A) young male *A. ararauna* (ringed/ AA1032) killed in the electrical network in 2014. Burns on the face and feet; (B) an individual of *A. chloropterus* stuck on the electric lines of the electrical distribution network surrounded by the leaves of *Terminalia catappa*

Photo: Nara Pontes.

Photo: Marcos Ermínio. Source: Jornal Campo Grande News, June 2017.

Figure 5 – Images demonstrating the proximity of nests to the urban electrical energy lines: (A) natural nest (n.86) of A. *ararauna* and (B) a female of A. *ararauna* (nest n.16), perched on a post of the electrical energy distribution network.

Photo: Aline Calderan.

Photo: Edson Diniz.

The fact that nests are oftentimes near energy posts facilitates the perching of macaws on them, and consequently increases the chances of electrocution (Figure 5B). The correlation between bird migratory behavior and an increase in electrocution was related by Golmes et al. (2018), Garrido et al. (2009), Valverde et al. (2010), and Souza et al., (2017). These studies also reported other factors that increase susceptibility to electrocution such as feeding behavior and intra- as well as inter-specific defense of territory. Golmes et al. (2018) observed that the highest rate of electrocution in their study area was for the burrowing parrot (*Cyanoliseus patagonus*) with a total of 12 deaths/year. These birds migrate to the Patagonia region in the winter, the season wherein the deaths were registered, thus explaining the seasonal aspect of these electrocutions.

According to Aplic (2006), the electrocution of birds is the result of the interaction of biology, the natural environment, and human engineering. Electrocution risk factors are also related to habitat, the quantity of prey/food sources present, species behavior, age, season, and climate. Modifications of the natural environment, such as a reduction in the number of trees in urban areas, will cause birds to use structure of the electrical distribution network for perching instead of branches to rest, defend territory, forage, hunt, and make nests, which thus increase the risks of electrocution (SERGIO et al., 2004; GUIL et al., 2011; FERRER, 2012; PEREZ-GÁRCIA et al., 2011). Golmes et al. (2018) emphasize this idea by reporting birds deaths by electrocution in open areas such as pastures and shrubland where there are kilometers of the electrical distribution network and very few if no trees present.

In the current study, the mortality of adults of *A. ararauna* as well as *A. chloropterus* was predominant. With respect to age range, it is important to consider that when adults have the highest rate of mortality of a species this will severely decrease the fertility of the population and therefore reproductive success (PEREZ-GÁRCIA et al., 2011). The largest loss of adults observed by Perez-Gárcia et al. (2011) differed from that in Godino et al. (2016) who related that mortality of raptor species due to electrocution occurred principally in young birds. According to the authors, this factor is influenced by the area occupied by these individuals since the study was conducted in an area where juvenile birds are dispersed from their nests where there was a high quantity of prey, which is favorable to intense hunting activity. This same result was reported by Sérgio et al. (2004) who studied an owl species (*Bubo bubo*) in the Italian Alps and estimated that about 17% of young that left their nests were subsequently lost to electrocution. Furthermore, these authors stated that in the long term this would not affect the reproductive success of this species. However, it is necessary to consider that this loss of birds is not a natural process. Therefore, over time this species could suffer the effects of a reduction in population growth considering the number of offspring that reach reproductive age.

In the case of *A. ararauna*, the mortality rate of young and adults in an urban area of Campo Grande is principally related to nest location and feeding sites, both of which are near the electrical energy distribution lines. Furthermore, the absence of trees for perching increases the chances for accidents to occur. In Campo Grande, it can be concluded that electrocution is a factor that has affected species' reproductive success since most deaths were of adults of reproductive age, which are responsible for introduction of young birds into the population. In contrast, the loss of young birds also has a negative impact since this reduces the number of adults in the future population. The loss of young and adults was also related by other authors who studied the impacts of electrocution on the population dynamics of a large range of bird species in diverse places around the world (SÉRGIO et al., 2004; HUNT; HUNT, 2006; SCHAUB et al., 2010; GUIL et al., 2011; PEREZ-GÁRCIA et al., 2011; CHEVALLIER et al., 2015; GODINO et al., 2016; SOUZA et al., 2017). However, if measures were undertaken to reduce, prevent and eliminate these accidents, these populations could be conserved and/or recuperated (SCHAUB et al., 2010; GUIL et al., 2011; PEREZ-GÁRCIA et al., 2011; CHEVALLIER et al., 2015; GODINO et al., 2016; SOUZA et al., 2017).

A study done on Bonelli's eagle (*Aquila fasciata*), showed that after electrical isolation of energy distribution lines, the survival rate for all age groups increased due to a decrease in mortality by electrocution (CHEVALLIER et al., 2015). Furthermore, the authors concluded that the survival of adults was key to this species being able to maintain a stable number of young individuals in the population. For this reason, insulation of energy distribution lines is an efficient way to manage for the conservation of populations of large species of birds.

Besides the loss of individuals which reduces the decrease in populations, electrocution causes large financial losses to the companies that provide electricity since equipment becomes damaged, and this can increase the chances of fires and interruptions in energy provision (APLIC, 2006; BURGIO et al., 2014; GUIL et al., 2018; SOUZA et al., 2017). An example of this comes from the monk parakeet (*Myopsitta monachus*), a species from South America that was introduced to the United States and that nests on electrical energy distribution structures which has caused substantial financial losses for companies that provide electricity in that country (AVERY et al., 2014; RED et al., 2014).

In this context, mitigation actions to prevent these types of accidents are advantageous and viable for the companies that provide electricity, and these actions will have positive repercussions for the conservation of large macaws in the city. Mitigation actions should consider factors such as the target species and its behavior and ecology, body size, seasonality, climate conditions, and factors that increase susceptibility to electrocution, as well as the costs and viability of management of electrical energy distribution structures (BEVANGER, 1994; AVERY et al., 2014; BURGIO et al., 2014; RED et al., 2014; CHEVALLIER et al., 2017).

In Campo Grande, the local company that provides electricity conducts tree pruning operations of trees that are impacting the electrical energy distribution structures. This company also substitutes unprotected structures for ones that are protected. However, there are no available documents available for public viewing that explains the details and policies related to these substitutions. Despite this discrepancy, the list of electrical energy distribution structures given priority for substitution and used by the company is created and managed by the Arara Azul Institute. This type of cooperation between conservation organizations and private companies is an example of successful conservation management and is not unique to large macaws but also exists for other species.

After interlocution and planning between the different institutions involved in this management, the substitutions are conducted at points where there is a high probability of accidents involving large macaws. These actions have the objective of unifying the efforts of non-governmental organizations and are excellent examples that can serve to create new partnerships that aim to find solutions for the conservation of biodiversity.

Conclusions

- Electrocution of large macaws is an accident that frequently occurs in the urban area of Campo Grande. The data from this study demonstrate that this is an important cause of mortality that must not be ignored because it affects the survival and dynamics of the populations of large macaws in the study area;

- Electrocution of macaws is related to body size and wingspan for *A. ararauna* and *A. chloropterus*, as well as location and proximity of food resources and nests to electrical structures;

- The results from this research can serve to direct new studies in urban ecology in Campo Grande and other cities, with the goal of elaborating mitigation measures for biodiversity conservation, because electrocution is a problem that affects a large diversity of fauna species in urban areas.

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SciELO

Mortalidade das grandes araras por eletrocussão em área urbana, Campo Grande, Mato Grosso do Sul

Larissa Tinoco
Aline Calderan
Sabrina Cristiane Appel
Eliane Vicente
Neiva Maria Robaldo Guedes

Resumo: A eletrocussão é tema pouco relatado para as grandes araras. O objetivo deste trabalho foi analisar a mortalidade das araras por eletrocussão na área urbana de Campo Grande, Mato Grosso do Sul. Entre 2011 e 2020 foram registradas 59 araras mortas por eletrocussão, tendo como vítimas duas espécies: ***Ara ararauna*** (Linnaeus, 1758) e a ***Ara chloropterus*** (Gray, 1859). ***A. ararauna*** foi a espécie com maior incidência, com 48 aves mortas, seguida da ***A. chloropterus***, com 11 indivíduos. A eletrocussão foi um importante fator de perda das grandes araras no ecossistema urbano. O tamanho corporal, a envergadura das asas e o comportamento das araras, bem como a localização e proximidade das estruturas elétricas com os recursos alimentares e de nidificação favoreceram as chances de eletrocussão. Logo, é necessário desenvolver medidas de mitigação para conciliar o desenvolvimento sustentável de uma cidade de porte médio como Campo Grande com a conservação da biodiversidade.

***Palavras-chave*:** Psittacidae; Ecologia Urbana; Rede Elétrica; Conservação.

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SciELO

Mortalidad de Guacamayos por electrocución en área urbana, Campo Grande, Mato Grosso do Sul

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Artículo original

Resumen: La electrocución es tema poco reportada en los guacamayos. El objetivo de este trabajo fue analizar la mortalidad de guacamayos en el área urbana de Campo Grande, Mato Grosso do Sul. Entre 2011 y 2020 fueron registrados 598 guacamayos muertos por electrocución teniendo como víctimas, dos espécies: ***Ara ararauna*** (Linnaeus, 1758) y ***Ara chloropterus*** (Gray, 1859). ***A. ararauna*** fue la especie con más incidencia, con 48 aves muertas, seguida de ***A. chloropterus***, con 11 individuos. La electrocución es la causa importante de pérdida para los guacamayos en el ecosistema urbano. El tamaño corporal, la envergadura de las alas y el comportamiento urbano de los guacamayos, bien como la localización y la proximidad de los tendidos eléctricos con los recursos alimenticios y de nidificación favorecido las posibilidades de electrocución. Por lo tanto, es necesario desarrollar medidas de mitigación conciliar el desarrollo sustentable de una ciudad mediana como Campo Grande com la conservación de la biodiversidad.

Palabras-clave: Psittacidae; Ecologia Urbana; Tendido Eléctrico; Conservación.

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