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Conflicts between humans and crocodilians in urban areas across Brazil: a new approach to support management and conservation

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ABSTRACT

Crocodilian-human conflicts, caused especially by urban expansion and habitat destruction, have been considered one of the main threats to the conservation of these species worldwide. In Brazil, such conflicts have been documented with crocodilian species all over the country. This study identified 400 conflict events in on-line journalistic news between humans and caimans within Brazilian cities between 2016 and 2021. *Caiman latirostris* (57.3%) was the most common species found in large urban centers in the Northeastern and Southeastern regions. Most encounters in which the date was informed were registered in the wet season (64.5%), and the rescues were mainly carried out by the environmental military police and fire brigades. We outlined management protocols to be undertaken by environmental agencies during crocodilian rescues to minimize animal stress and risk of accidents. The increasingly common interaction between humans and caimans in urban environments is an important alert to envisage best conducts for the coexistence between people and caimans in Brazil and shows the need to invest in public policies to mitigate the negative effects of urbanization on wildlife.

Keywords: Caimans; Habitat loss; Journalistic news; Fauna rescue, Urbanization.

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SIGNIFICANCE STATEMENT

The main objective was to present an overview of crocodilian-human conflicts in Brazilian urban areas. The urbanization process poses a real threat to crocodilian conservation due to the destruction of its natural environment. For this reason, we created standardized management protocols to help public agents responsible for the rescues in Brazilian cities.

INTRODUCTION

Cities are expanding worldwide, and urban processes have been altering landscapes and affecting ecological, biological, and behavioral processes of biodiversity in recent decades (Angel et al. 2012; Luniak 2004). Direct impacts (e.g., habitat fragmentation) or indirect ones (e.g., contamination of water bodies) can lead to a loss of biological diversity on a local, regional, and global scale (McDonald et al. 2019), including animals of various species (Vale and Prezoto 2019). Human-wildlife coexistence is a crucial goal of conservation, and the motivation for most work on conflicts has been to protect species from anthropogenic threats (Pooley et al. 2021a). Crocodilians consist one of the most impacted groups of vertebrates by habitat overlap with humans. In Latin American and Caribbean countries, negative interactions between humans and crocodilians have increased by 39% between 2018 and 2020 (Pooley et al 2021b). This may cause fatal incidents involving humans (as documented in Colombia by Balaguera-Reina and Farfàn-Ardia 2018 and in Mexico by García-Grajales and Buenrostro-Silva 2019), and destruction of natural sites due to greater anthropogenic activity (González-Desales et al. 2021). In Brazil, several anthropogenic activities threaten crocodilian populations, such as hydroelectric dams (Campos 2015), roads (Campos et al. 2012), illegal hunting (Campos and Muniz 2019; Da Silveira and Thorbjarnarson 1999; Mendonça et al. 2016; Mourão et al. 1996; Muniz et al. 2021) and urbanization (Mascarenhas-Júnior et al. 2018). Such threats mainly affect crocodilian species locally, while the natural stocks of these species at a larger scale appear not to have been substantially impacted (Campos et al. 2019; Magnusson et al. 2019; Marioni et al. 2021; Siroski et al. 2020).

Brazilian territory has the richest diversity of crocodilian species globally, with six recognized caiman species, including several distinct new evolutionary lineages (Borges et al. 2018; Bittencourt et al. 2019; Muniz et al. 2018; Roberto et al. 2020). Exponential human growth, associated with a disorderly expansion of urban areas, has resulted in huge habitat loss, increasing the number of human conflicts (Mascarenhas-Júnior et al. 2018). In this modern scenario, new records are published regularly in the news and social media, reporting crocodilian occupation within cities and conflicts with local people, with a negative impact for both animals and humans, including pets or livestock (Basset 2016). Despite the increased number of cases reported in the last decade, this problematic situation has never been explored using rigorous scientific research (Balaguera-Reina and Farfàn-Ardia 2018).

This manuscript aims to document crocodilian occurrence in urban areas in Brazil, creating a major database based on online local news to record and map crocodilian-human interactions in all regions across the country. Due to the complete lack of knowledge of this situation in Brazil, this database will help understand the factors responsible for increasing crocodilian-human encounters. Here we evaluated information about 1) the spatial distribution of encounters between people and crocodilian species in Brazilian urban areas, 2) the seasonality of the encounters/conflicts in each region, and 3) the possible factors that explain the increase of these encounters in some Brazilian cities. Furthermore, we outlined management protocols to be undertaken by environmental agencies during crocodilian rescues to minimize animal stress and risk of accidents, supporting government environmental agencies to create better solutions that will mitigate conflicts and help improve the management and conservation of this important group of reptiles.

MATERIAL AND METHODS

To access information on human-crocodilian interactions, we extensively searched for news reporting occurence of crocodilians in urban areas at Google database, using the keywords “jacaré," “resgate," “cidade," (that means “caiman”, “rescue”, and “city” in Portuguese), and the name of each Brazilian state, individually in quotes. We refined the searches over the past five years (01 January 2016 to 31 May 2021) using Google’s Search in “news" tab, sorting from the

most recent to the oldest, and taking care to exclude duplicate reports of the same record. Also, we activated Google alerts between January 2020 and July 2021, adding reports that were sent to us via email, with the same criteria of keywords. To minimize bias caused by Google's algorithm, all authors carried out searches between June/2021 and July/2021 in different regions of Brazil.

For each news item, when available, we filtered information related to the date, caiman species, state, city, journal name, accident events, entity responsible for the rescue/record, and and the caiman release point or destination. Whenever possible, we also identified the seasonal period (dry or wet) based on the record date (Peel et al. 2007). In addition, to evaluate the relationship between records and season, we excluded 2021 data, which we sampled only until May, and to avoid differences between rainfall cycle across Brazilian regions. We used a chi-square test to evaluate the difference between seasons (dry and wet) and the records for each month. We considered $p < 0.05$ as our level of significance.

We used journalistic news with photos or videos to confirm the species, considering *Caiman latirostris*, *Caiman crocodilus*, *Caiman yacare*, *Paleosuchus palpebrosus*, *Paleosuchus trigonatus* and *Melanosuchus niger* as naturally distributed in Brazilian territory. Species identifications in pictures were carried out by at least two authors to ensure fidelity in identification. Only records in urban areas were considered in our sample and news with two different species were considered as one journalistic news record, but two species records. Species in reports that did not have images were considered Not Assessed (N/A). We could not determine the genus in "N/A" cases because at least two genera are distributed in the regions/states where the news without photos were published.

RESULTS AND DISCUSSION

We registered all six Brazilian crocodilian species being documented as in direct contact with humans (Figure 1A), in areas with a lot of solid waste (Figure 1B), rescued in risk areas (Figure 1C), crossing roads (Figure 1D), killed by citizens (Figure 1E), and in small lakes with dense groups (Figure 1F).

We recorded 400 journalistic news, 365 on Google Search and 35 by Google Alerts, for the last five years (2016–2021) (Figure 2). *Caiman latirostris* was the most representative species, in 57.3% (N = 229) of the total records, followed by *C. crocodilus* (18%, N = 72), *P. palpebrosus* (9%, N = 36), *M. niger* (5.5%, N = 22), *C. yacare* (5%, N = 20), *P. trigonatus* (3.8%, N = 15), and Not Assessed (1.4%, N = 6). Disregarding the Google Alerts data, most reports (37.5%, N = 137) were published in 2020 (Figure 3), suggesting a real rising trend. Of 293 records in which date was informed, we identified that 35.5% (N = 104) occurred in the dry season, while the majority occurred in the wet season (64.5%, N = 189, $p < 0.05$) (Table 1). Aspects of crocodilian behavior and life history may account for the variation in the rate of encounters and the number of records between species in urban environments. As an example, *C. latirostris*, which has one of the largest latitudinal distributions among crocodilians (Coutinho et al. 2013; Verdade and Piña 2007) and easily adapts to urban environments (Freitas-Filho 2008; Marques et al. 2020), had the highest number of records in our study; and *P. trigonatus*, whose behavior is cryptic (Magnusson and Lima 1991), was the least recorded. Furthermore, crocodilians' behavioral patterns are often characterized by seasonality. Dry periods can reduce the movement of caimans due to reduced availability of territory and food (Campos et al. 2006). With the onset of the wet season, they start to disperse, searching for resources. In urban environments, rescues are mostly observed in flood periods, when water bodies are connected to floodplain areas (Negromonte et al. 2021), or channels (natural or artificial) connected to the urban drainage system (Oliveira et al. 2021), places often overlapped by roads, houses, and other buildings.

In the past two decades, the massive access to smartphones has made it possible to record wildlife, especially in urban centers (Teacher et al. 2013; Olson et al. 2014). Furthermore, the publication of records on social media has aroused the interest of the national media and websites that end up replicating these findings. Our data showed a yearly increase in news, a trend that has remained steady until the end of the study (May 2021), when in just five months, 136 events were recorded, more than 92% of the total amount reported for 2020 (N = 147). In addition to greater access to technology (e.g., smartphones and mobile Internet networks), the shutdown period during the pandemic COVID-19 contributed to reducing the use and access to streets and urban protected areas. With less people movements, the animals possibly felt safer to disperse in cities, resulting in a higher rate of encounters and records in the media (Manenti et al. 2020; Zellmer et al. 2020).

The Northeastern region of Brazil had the highest number of reports (29%, N = 116), with increased representation in the states of Pernambuco (PE; N = 36) and Bahia (BA; N = 22). The Southeast was the next (26.8%, N = 107), led by Rio de Janeiro (RJ; N = 45) and São Paulo (SP; N = 39) states. We recorded 24.8% (N = 99) of the reports for the Northern region, most in the states of Amazonas (AM; N = 33), Tocantins (TO; N = 22), and Pará (PA; N = 20).

Figure 1. *Caiman latirostris* species in urban areas. A: direct contact with humans; B: in areas with a lot of solid waste; C: rescued by researchers at neighborhoods; D: crossing roads; E: killed by citizens; F: in small lakes with dense groups.

Table 1. Percentage of journalistic news recording caimans in urban areas in different regions of Brazil during wet and dry seasons between January 2016 and May 2021. MW: Midwest; N: North; NE: Northeast; S: South; SE: Southeast.

Species	MW		N		NE		S		SE	
	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry
Caiman crocodilus	85.7%	14.3%	70%	30%	47.4%	52.6%	-	-	-	-
Caiman latirostris	38.5%	61.5%	-	-	57.8%	42.2%	100%	0	65.8%	34.2%
Caiman yacare	70%	30%	-	-	-	-	-	-	-	-
Melanosuchus niger	-	-	65%	35%	-	-	-	-	-	-
Paleosuchus palpebrosus	87.5%	12.5%	70.6%	29.4%	58.3%	41.7%	-	-	-	-
Paleosuchus trigonatus	100%	0%	83.3%	16.7%	-	-	-	-	-	-
Not Accessed	100%	0%	100%	0%	0%	100%	-	-	-	-

On the other hand, the Midwestern region (13.3%, N = 54) was represented mainly by the states of Mato Grosso do Sul (MS; N = 28) and Mato Grosso (MT; N = 11). Finally, the Southern region (6.1%), was represented primarily by the states of Santa Catarina (SC; N = 12) and Rio Grande do Sul (RS; N = 7)

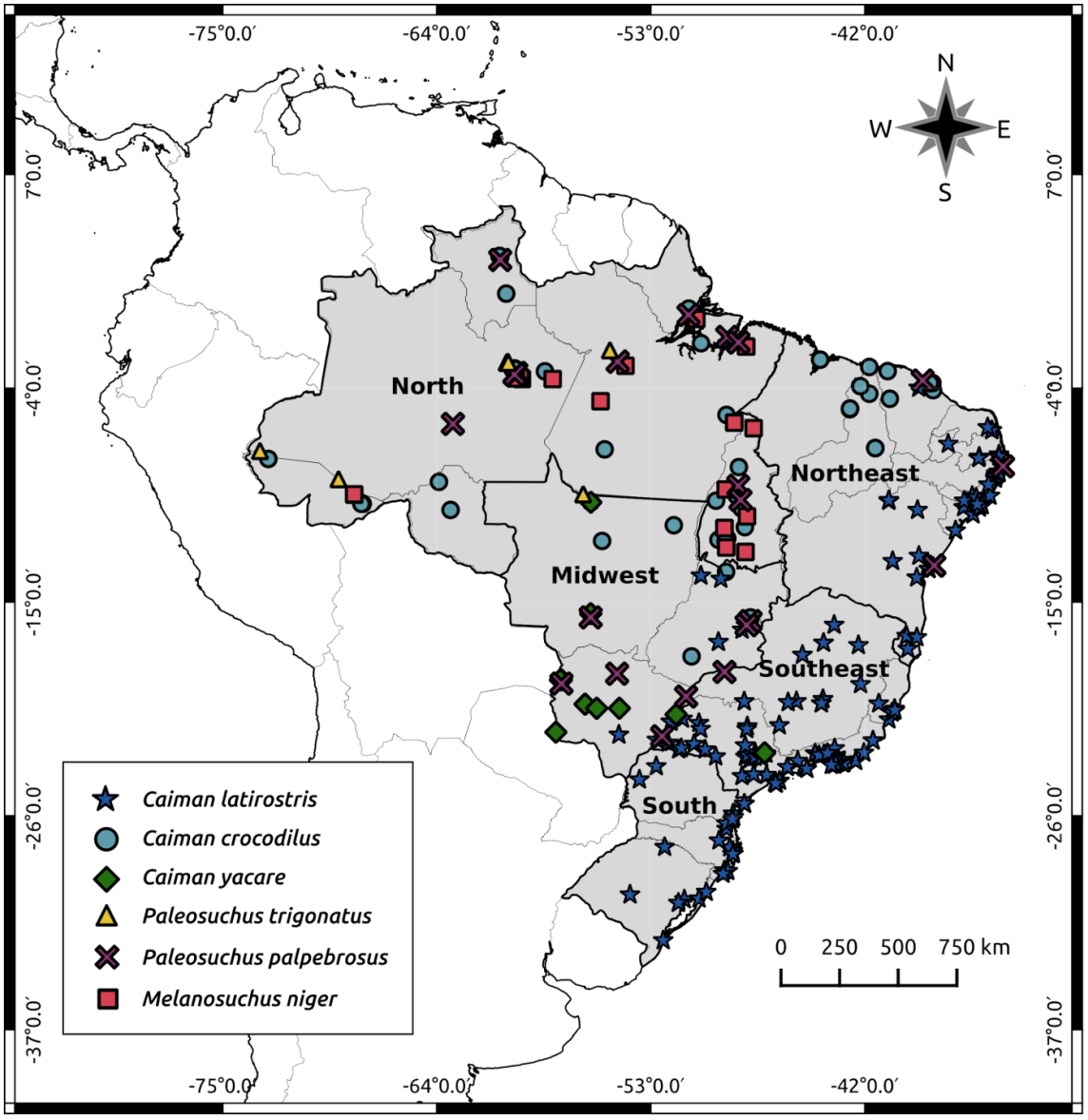

Figure 2. Spatial distribution for human-caiman encounters recorded on digital media between 2016 and 2021. *Caiman latirostris* (star, ⋆), *Caiman crocodilus* (circle, ◯), *Caiman yacare* (diamond, ⋄), *Paleosuchus trigonatus* (triangle, △), *Paleosuchus palpebrosus* (cross, ×), and *Melanosuchus niger* (square,).

(Figure 4; Additional File 1).

In the Northeast of Brazil, there are many landscapes changes and natural environment destruction in large cities, mainly in state capitals and neighboring cities, where caimans were most registered. More than 90% of the original Atlantic Rainforest has been lost to deforestation and urban expansion (Lôbo et al. 2011), increasing the human-crocodilian conflict by reducing caimans' habitats. The high rate of *C. latirostris* records reflects this overlap, given it is a well-distributed species in this forest domain and in urban areas in northeastern Brazil (Mascarenhas-Júnior et al. 2018; Siroski et al. 2020). This degradation scenario also occurs in other large cities or metropolitan regions, such as Fortaleza (CE), Teresina (PI), and São Luís (MA; Silva et al. 2019), with a higher frequency of *C. crocodilus*.

The Northeastern region has a marked hydrological cycle with limited rainfall (up to five months) and perennial rivers (Rebouças 1997). In the Recife (PE) metropolitan region, the branched water network offers habitats and conditions for the establishment of caimans' populations (Mascarenhas-Júnior et al. 2018). In addition, destruction of the riparian forest exposes water bodies to roads or houses, which facilitates specimens' dispersion, and increases solid waste into the water systems (Bezerra et al. 2018). In Salvador (BA), the fourth largest city in Brazil,

and the main economic center in the Northeast, urbanization has been illegally occupying natural areas (Souza 2001) and weakening urban natural ecosystems (Machado et al. 2019). Soil and river contamination (Moura et al. 2010), as well as local temperature, changes due to vegetation suppression (Correia-Filho et al. 2019), which can directly affect the biological cycles of urban species, mainly crocodilians, considering they are ectothermic and potential top predators in aquatic environments (Somaweera et al. 2020).

In Rio de Janeiro state, the recent expansion of large cities has caused the destruction of local landscapes and natural environments (such as restingas [sandbars or shoals], mangroves, and the Atlantic

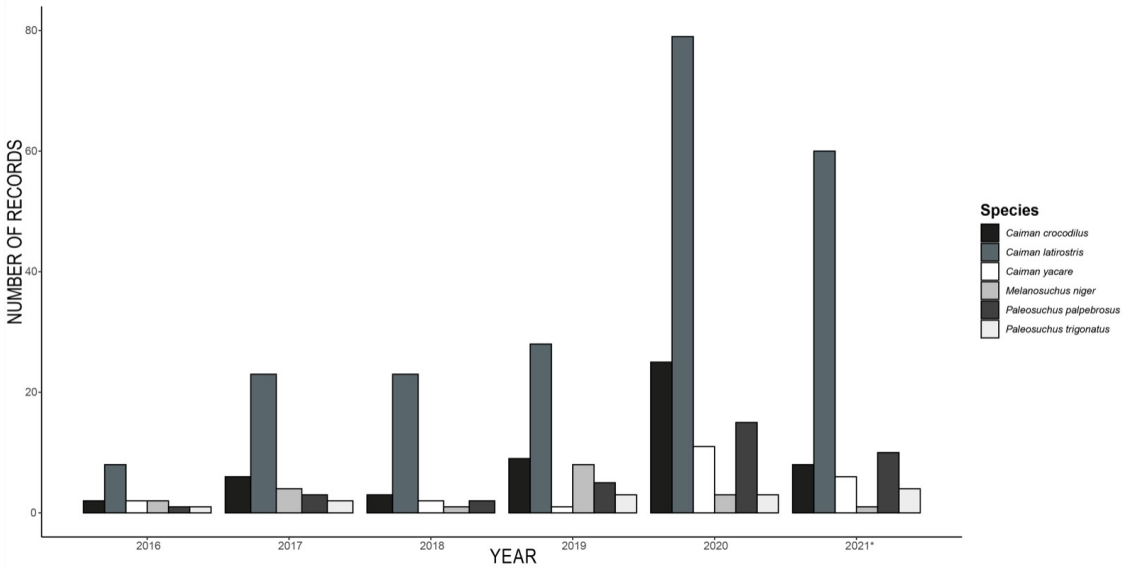

Figure 3. Records for humans and caiman species published on digital media and tracked using Google searches between 2016 and 2021 in Brazil.

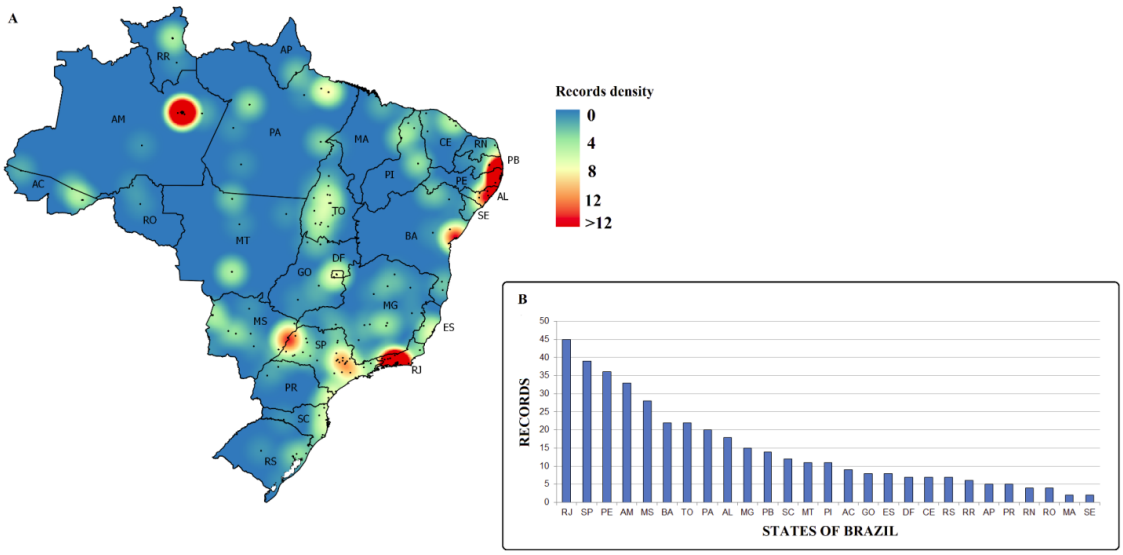

Figure 4. Human-caimans encounters recorded in online journalistic news in Brazil, between 2016 and 2021. Brazilian state names are abbreviated by two capital letters. AC: Acre, AL: Alagoas, AM: Amazonas, AP: Amapá, BA: Bahia, CE: Ceará, DF: Distrito Federal, ES: Espírito Santo, GO: Goiás, MA: Maranhão, MG: Minas Gerais, MT: Mato Grosso, MS: Mato Grosso do Sul, PA: Pará, PB: Paraíba, PE: Pernambuco, PI: Piauí, PR: Paraná, RJ: Rio de Janeiro, RN: Rio Grande do Norte, RO: Rondônia, RR: Roraima, RS: Rio Grande do Sul, SE: Sergipe, SC: Santa Catarina, SP: São Paulo, TO: Tocantins.

Rainforest; Díez and Montezuma 2021), which led to an increase in the occurrence of animals in urban areas. One of the most altered landscapes in Rio de Janeiro is the Lagoon Complex of Jacarepaguá, a well-known area for wild *C. latirostris* populations (Freitas-Filho 2008). Since 2010, mainly because of the choice of Rio de Janeiro as the host city of the Soccer World Cup and 2016 Olympic Games, many natural environments have been occupied (Lopes et al. 2014; Peres et al. 2018) and wetlands backfilled, drastically changing the flooded areas used by caimans. During dispersion in the search for new territories, several caimans are found in sewer channels or rescued on highways and houses (Freitas-Filho et al. 2013).

It is estimated that more than 70% of the Brazilian human population lives in regions covered by the Atlantic Rainforest, with more than 145 million people inhabiting 3,429 municipalities, which represents 61% of Brazilian cities (SOSMA 2021). Fragmentation of the biome for urban expansion limits access to essential resources for crocodilians, such as food, territory, and nesting areas (López-Luna et al. 2011). With the lack or scarcity of these resources, animals tend to disperse to new habitats, often seeking food offered by humans, creating a behavior of proximity and conditioning the caimans to settle in these areas waiting for food (Freitas-Filho et al. 2009). In addition, cities with many rivers, which create a branched water network, sewage systems and rainwater channels, facilitates the movement of caimans in urban environments, favoring their appearance in risk areas (Mascarenhas-Júnior et al. 2018).

Most of encounters in the Midwest region occurred between *C. latirostris* and people (N=12) who frequented a downtown natural lake in Três Lagoas city in the state of Mato Grosso do Sul. Individuals of *C. latirostris* can easily be spotted basking or walking on the running track that surrounds the lagoon, resulting in several encounters with people. In two events, four *C. latirostris* males (snout-vent length - SVL $>$ 90 cm) were removed from Lagoa Maior lake and released carrying radio transmitters in the Reserva Particular do Patrimônio Natural-RPPN Cisalpina (Campos, pers.com.). The entire rescue and translocation operation was carried out by the Municipal Environmental Secretariat, under the guidance of specialists, led by Zilca Campos, who also provided advice on measures to ensure safe interaction between animals and the people who use the area around the Lagoa Maior.

One of our records indicates that species introduced outside their natural occurrence area still maintain their populations in urban centers, such as *C. yacare*, reported in the municipality of Paulínia (SP), about 500 km away from its distribution (Campos et al. 2020). Initially, these animals were introduced into the state of São Paulo in the 1980s, with authorization from the national environmental agency, IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Renováveis), which allowed the installation of commercial breeding sites outside the occurrence area of the species. Most of these projects were abandoned, resulting in an incalculable number of releases in natural water bodies (Verdade 2004). The introduction of exotic or allochthonous species can be potentially harmful to ecosystems, and the presence of crocodilians outside their natural range is harmful to native species (Verdade 2004; Da Silveira et al. 2020). Introductions of *C. crocodilus* with established populations in South Florida, USA (Ellis 1980), and the escape of *Crocodylus moreletii* to the west coast of Mexico (Rodriguez et al. 2008), have been documented, potentially causing irreparable damage to local species and habitats.

The Northern and the Midwestern regions are home to the most remarkable crocodilian diversity in the country (five species), but this is not necessarily related to the higher number of human-crocodilian encounters in Brazil. Despite a high rate of urbanization, it still contains many legal protected areas around urban centers (Silva et al. 2017). According to our data, a large Black Caiman (*M. niger*) caused one fatal accident in a city in the state of Tocantins. Although uncommon, accidents involving this species have already been reported for the Brazilian Amazon (Bergamasco et al. 2018; Haddad-Júnior and Fonseca 2011; Marioni et al. 2013). It is noteworthy that this is the largest caiman species in the Brazilian territory (Thorbjarnarson 2010), and some of its attacks can be deadly. In the case mentioned above, the urban population killed the Black Caiman in retaliation for the incident, a practice reported for some countries in Latin America and the Caribbean (Pooley et al. 2021b). Over the past 20 years, Brazil has led the ranking of cases involving fatal crocodilian attacks in South America, with *M. niger* responsible for most of them (Pooley et al. 2021b). Those negative interactions can lead to aggressive measures from the population, such as nest destruction and crocodilian killings (Pooley 2020; Pooley et al. 2021a), even in situations of low risk and involving smaller species, such as species within the *Caiman* and *Paleosuchus* genera. The concern about *M. niger* occurrences in urban areas needs to be highlighted, as individuals can reach a total length of 6 meters (Medem 1983), thus representing a greater risk of fatal accidents. In addition, it is essential to emphasize that state capitals had a higher frequency of records within urban areas. Manaus is the city with the most reports (N = 28, 7% from Black Caiman), three times more cases than Belém (N = 9, 33% from Black Caiman), the second city in the North with the highest number of occur-

rences. The high number of records from Manaus may be explained by the marked urbanization process, associated with uncontrolled growth towards the preserved environments in the outskirts, the abundance of water bodies, and the forest fragments inside the city.

Crocodilian rescues were reported in 84% of journalistic news (N = 336). Most procedures were carried out by public agencies, such as fire brigades (N = 124), police (military or civilian; N = 119), and municipal environmental brigades (N = 38). On the other hand, 62 rescues (involving capture and handling) were carried out by the population and 57 by other fauna agencies that eventually helps in these procedures (e.g., Municipal Environmental Secretariats, Zoos, and Civil Defense). In Brazil, wildlife management must be carried out by authorized persons or organizations (private or public), even in urban areas. Until 2014, wildlife rescue demands in urban centers were conducted mainly by the IBAMA, environmental military police, and fire brigades (Mascarenhas-Júnior et al. 2018; Teixeira et al. 2016). Recently, as of the enactment of Complementary Law 140/2011 (Brazil 2011), fauna management has been decentralized, with the competence devolving upon each Brazilian state and/or city. Those idiosyncratic conditions lead to a lack of standardization in rescues, making it difficult for the population to know the most appropriate communication channel for help. Therefore, we recommend that environmental organizations or fauna rescue agencies should be the first to be contacted during risk situations with caimans, considering that they are trained and have adequate equipment for handling the animals. A good rescue by trained people or organizations can prevent accidents, or even animal death. Moreover, researchers and groups that work directly with caimans can provide technical support when necessary, such as the Instituto Jacaré in Rio de Janeiro-RJ (Freitas-Filho et al. 2013), Projeto Caiman in Vitória-ES (Mello et al. 2019) and Projeto Jacaré in Recife-PE (Mascarenhas-Junior et al. 2018).

The destination of the caiman was frequently reported (72.5%, N = 290). Returning specimens to their natural environment was the primary choice (72.4%, N = 210), followed by rehabilitation and screening centers (16.2%, N = 47), even when the individual had apparently good health conditions. In 17 cases (5.8%), caimans were relocated to other institutions (e.g., universities and zoos), but without information regarding their destination, and in 16 records (5.6%), caimans were found dead (seven of them killed by the local population). The destination of the animals after rescue is one of the most critical steps in the entire process involving conflicts with urban crocodilians. Goulart et al. (2010) recommend that rescued animals should be sent to screening and rehabilitation centers for possible veterinary treatment and subsequent release (Teixeira et al. 2016). It is vital to collect specimen data to monitor populations during the process and determine critical points of conflict. In cases where release is possible, we recommend that caimans should be moved far from the urban center, but prioritizing the same watershed, aiming to mitigate interactions with humans and potential damage to the environment (Da Silveira et al. 2020).

One of the significant challenges of managing Brazilian fauna is standardizing protocols of rescue and destination specimens. The decentralization of environmental activities makes this demand difficult, but solutions must be sought. More and more professionals who work with crocodilians in Brazil are strengthening relationships with, sharing experiences with, and joining in representative groups from all regions, such as Crocodylia Brasil, a Brazilian Reference Group on Crocodilians - Authorities by Species and Biomes (Bassetti et al. 2021). We strongly recommend that institutions responsible for fauna management (at state and municipal levels) contact crocodilian specialists so that the best procedures are carried out regarding the management of caimans in urban environments. In this sense, we developed a proposal for a standard protocol for the proper rescue, health treatment, data collection and destination of crocodilians in urban environments (Figure 5). It is important for humans to understand that wildlife is part of daily life in cities, and rescues should only be performed if animals and/or people are at risk. Under these conditions, we suggest that people contact the fire departments, military police and guards or local environmental agencies for the proper rescue. The capture and containment procedure must be carried out by a trained team with adequate equipment, such as: locking cable snares, for capture; cloths, to cover the eyes and minimize the caiman's stress; and adhesive tapes and ropes, to close and immobilize jaws and limbs, respectively, preventing bites and abrupt movements. After the process, the caiman must be taken to rehabilitation and/or screening centers for later release in a natural water body far from the city, but in the same hydrographic basin. We also suggest taking basic biometric data (at least total and snout-vent length) and biological samples, as well as conducting scutes cut, associated with tags or microchips (when possible) to mark rescued specimens, so that they can be properly monitored. This standard protocol, allied with other local recommendations from specialists in crocodilians, is important to promote animal welfare, reduce the risk of accidents, and encourage caiman protection and conservation policies within cities.

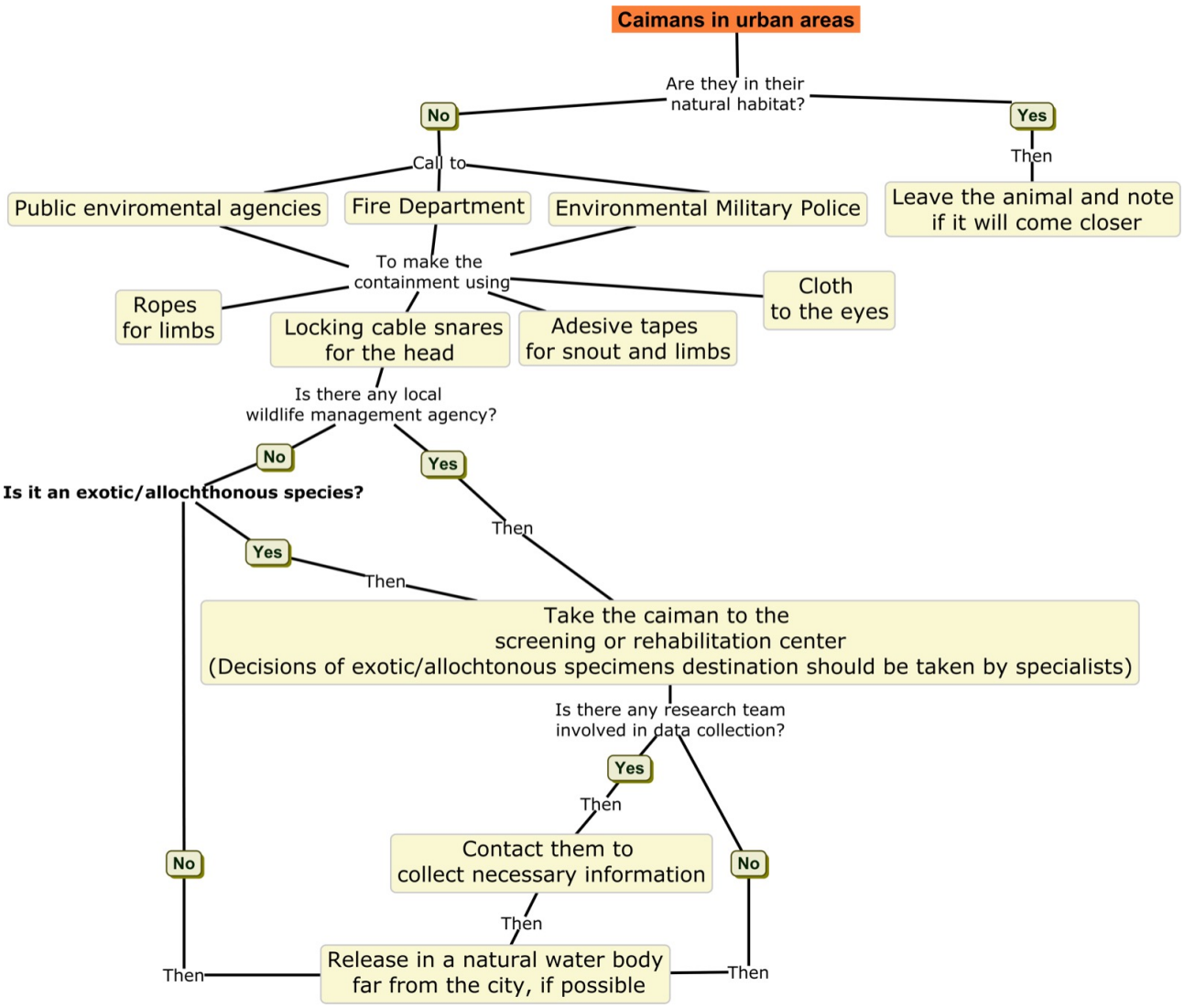

Figure 5. Flowchart of actions to be taken in rescue and translocation of crocodilians in urban areas of Brazilian cities – Training of those involved in operations to be carried out by the Municipal Environmental Secretariats.

CONCLUSION

1. *Caiman latirostris* was the most recorded species and had the widest distribution in Brazilian urban centers;

2. Encounters between humans and caimans have gradually increased in the last two years, which could be associated with access to technology, mobile cellular networks, and probably influenced by lockdown caused by the SARS-CoV-2 pandemic scenario;

3. Urban expansion and the environmental, behavioral, and natural history of crocodilians are possibly directly related to caiman occurrence and records in urban environments, especially in the wet season and in the Southeastern, Northeastern and parts of Northern regions of Brazil;

4. The contact between humans and caimans in urban areas can lead to conflicts, such as accidents (fatal or not) and pet deaths, leading to extreme measures by the population. Therefore, it is suggested that government agencies should consider crocodilian-human interaction, protection strategies, and control measures in their public policies;

5. Solid strategies and standardized management protocols for crocodilians must be implemented at the national level, including public agencies that could receive technical training from research groups and experts in the field.

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DATA AVAILABILITY

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

CONTRIBUTION STATEMENT

Conceived the presented idea: PBMJ, FM, LABB, ZC.
Carried out the experiment: PBMJ, FM, FM, RFF, TCGP, LABB, ZC.
Carried out data analysis: PBMJ, FM, FM, ZC.
Wrote the first draft of the manuscript: PBMJ, FM, FM, RFF, TCGP, LABB, ZC.
Review and final writing of the manuscript: PBMJ, FM, FM, RFF, TCGP, LABB, ZC.
Supervision: ZC, LABB.

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Additional Files

Add File 1. Number of records of journalistic news on caimans in urban areas in different regions and states of Brazil between January 2016 and May 2021.

Region	State	City	Number of records
Midwest	DF	Brasília	7
	GO	Goiânia	1
		Itaberaí	1
		Itumbiara	1
		Nova Gama	1
		Porangatu	2
		Rio Verde	1
		São Miguel do Araguaia	1
	MS	Aquidauana	2
		Bataguassu	2
		Campo Grande	4
		Corumbá	2
		Coxim	1
		Ladário	3
		Miranda	2
		Nova Alvorada do Sul	1
		Paranaíba	1
		Porto Murtinho	1
		Três Lagoas	9
	MT	Alta Floresta	3
		Cana Brava do Norte	1
		Cuiabá	6
		Sinop	1
North	AC	Cruzeiro do Sul	2
		Rio Branco	4
		Sena Madureira	3
	AM	Careiro da Várzea	1
		Iranduba	1
		Itacoatiara	2
		Manaus	28
		Tapauá	1
	AP	Macapá	5

North	PA	Belém	9
		Breves	1
		Itaituba	1
		Marabá	3
		Marituba	1
		Novo Progresso	1
		Santarém	4
	RO	Monte Negro	1
		Porto Velho	3
	RR	Boa Vista	5
		Rorainópolis	1
	TO	Araguacema	1
		Araguaína	1
		Araguatins	1
		Cariri	1
		Colinas	1
		Formoso do Araguaia	2
		Guaraí	1
		Gurupi	3
		Lagoa da Confusão	2
		Marianópolis	1
		Miracema	1
		Miranorte	1
		Palmas	3
		Peixe	1
		Porto Nacional	1
		Silvanópolis	1
Northeast	AL	Arapiraca	1
		Branquinha	1
		Coruripe	2
		Maceió	3
		Marechal Deodoro	7
		Palmeira dos Índios	1
	BA	Pilar	1
		Porto de Pedras	1
		Santana do Mundaú	1
		Canudos	1
		Eunápolis	1
		Feira de Santana	1

		Itaberaba	1
		Itamaraju	1
		Juazeiro	1
		Porto Seguro	1
		Salvador	14
		Valença	1
	CE	Caucaia	2
		Fortaleza	1
		Granja	1
		Horizonte	1
		Ipueiras	1
		Paracuru	1
	MA	São Luís	2
	PB	Cabedelo	1
		Campina Grande	1
		João Pessoa	8
		Lagoa Seca	1
		Picos	1
		Pitimbu	1
Northeast		São Bento	1
	PE	Cabo de Santo Agostinho	2
		Camaragibe	1
		Gameleira	1
		Igarassu	1
		Jaboatão dos Guararapes	3
		Olinda	4
		Paulista	8
		Petrolina	2
		Recife	14
	PI	Esperantina	1
		Parnaíba	1
		Picos	4
		Piripiri	1
		Teresina	4
	RN	Ceará-Mirim	1
		Natal	2
		São Gonçalo do Amarante	1
	SE	Aracajú	2
South	PR	Matinhos	1
		Paranaguá	1

South		Paranavaí	1
		Pontal do Paraná	1
		Umuarama	1
	RS	Arroio do Sal	1
		Gravataí	1
		Guaíba	2
		Osório	1
		Rio Grande	1
		Santa Maria	1
	SC	Capivari de Baixo	1
		Concordia	1
		Florianópolis	4
		Garuva	1
		Indaial	1
		Jaguaruna	1
		Joinville	1
		Laguna	1
		Tijucas	1
Southeast	ES	Guarapari	1
		Laranja da Terra	1
		Serra	4
		Vitória	2
	MG	Araçuaí	1
		Belo Horizonte	2
		Bom Despacho	1
		Carmo do Rio Claro	1
		Governador Valadares	1
		Janaúba	1
		Lagoa Santa	2
		Luz	1
		Montes Claros	2
		Pirapora	1
		Uberaba	2
	RJ	Barra do Piraí	1
		Campos dos Goytacazes	3
		Iguaba Grande	1
		Macaé	1
		Maricá	1
		Niterói	7
		Paraíba do Sul	1

		Paraty	1
		Porto Real	1
		Rio de Janeiro	21
		São Gonçalo	2
		São José do Imbassaí	1
		Vassouras	3
		Volta Redonda	1
Southeast	SP	Águas de São Pedro	1
		Araras	1
		Bertioga	1
		Brejo Alegre	1
		Caçapava	1
		Cananeia	1
		Cananéia	4
		Charqueada	2
		Guaratinguetá	1
		Holambra	1
		Hortolândia	1
		Itapetininga	1
		Itapira	1
		Jardinópolis	1
		Limeira	1
		Marília	1
		Martinópolis	1
		Nova Lusitânia	1
		Osasco	1
		Paulínia	2
		Paulistânia	1
		Pereira Barreto	1
		Piracicaba	1
		Presidente Venceslau	1
		Regente Feijó	1
		Ribeirão Preto	1
		Santos	5
		São Carlos	1
		Sorocaba	1
		Tupã	1