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Raptor Journal 2025, Vol. 19. DOI: 10.2478/srj-2025-0001

Occurrence of the great black hawk (*Buteogallus urubitinga*) in the largest urban area of South America

Výskyt myšiaka vodného (*Buteogallus urubitinga*) v najväčšej mestskej oblasti Južnej Ameriky

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Abstract: The great black hawk is widely distributed in South America, including Brazil and the state of São Paulo, but it is uncommon in the region of the city of São Paulo (Grande São Paulo), the largest urban area in South America. We compiled, organized, and analyzed available records of the species for this highly urbanized region in the literature, ornithological databases, and online birdwatching platforms, and produced field data. We obtained 13 records from four locations between 2018 and 2024. All records were associated with humid and flooded environments, mainly artificial reservoirs. The long period without records and the low number of recent detections suggest several possibilities: the species has always been uncommon in Grande São Paulo, perhaps for geographic, environmental, ecological, and/or climatic reasons; the species may be colonizing lakes and reservoirs created in recent decades; or the species is just a regional vagrant bird in Grande São Paulo. Nonetheless, the presence of this hawk in the surroundings of the largest urban area in South America shows the importance of the wetlands and floodplain remnants of the Alto Tietê Hydrographic Basin, which are threatened environments that urgently need protection by the establishment of conservation units.

Abstrakt: Myšiak vodný, je široko rozšírený druh Južnej Ameriky vrátane Brazílie a štátu São Paulo. V oblasti mesta São Paulo (nazývaného Veľké São Paulo), najväčšej mestskej oblasti Južnej Ameriky, je však tento druh zriedkavý. V práci sme zozbierali, spracovali a analyzovali dostupné literárne údaje, údaje z ornitologických databáz a online platforiem o sledovanom druhu v tomto vysoko urbanizovanom regióne. Získali sme 13 záznamov zo štyroch lokalít v rokoch 2018 až 2024. Všetky záznamy boli spojené s vlhkým a zaplaveným prostredím, najmä s umelými vodnými plochami. Dlhé obdobie bez záznamov a nízky počet nedávnych zistení naznačuje niekoľko možností: z možných geografických, environmentálnych, ekologických a/alebo klimatických dôvodov bol druh v sledovanom území vždy zriedkavý; druh môže kolonizovať jazerá a vodné plochy vytvorené v posledných desaťročiach; alebo sa druh v oblasti Veľkého São Paulo vyskytuje len eraticky. Napriek tomu prítomnosť myšiaka vodného v okolí najväčšej mestskej oblasti v Južnej Amerike poukazuje na význam mokradí a zvyškov záplavových oblastí v hydrografickom nížine Alto Tietê, ktoré predstvujú ohrozené prostredie a naliehavo vyžaduje ochranu prostredníctvom zriadenia chránených území.

Key words: Brazil, Atlantic Forest, city of São Paulo, field inventory, conservation

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Acknowledgements: The Marina Sailing Center, especially Seu Romeu (In memoriam) and Fernando Bonini, as well as all the employees for their support in the research. Fred Pallinger for the information about the great black hawk.

Luiz Fernando Figueiredo for information on the CEO registry. Carlos Gussoni and Luciano Moferrari for information from eBird and WikiAves. Luís Fábio Silveira for information from the Museu de Zoologia da USP. Paulo Rogerio for adjustments to some figures.

Introduction

The great black hawk (*Buteogallus urubitinga*) occurs exclusively on the American continent, in Central and South America, from Mexico to Argentina and throughout Brazil (Sick 1997, van Dort 2020). It lives in open and semi-open humid natural areas, including swamps, mangroves, wetlands and riverine forests, but can also occur in anthropized areas, such as rice fields, flooded pastures and wetlands near oil refineries (Olmos and Silva e Silva 2003, Pallinger and Menq 2021). It has been recorded in large urban areas of Brazil and Argentina, among other regions, where they were considered unusual, a type of occurrence that is still little known for most of its geographic distribution (Sick and Pabst 1968, Maciel 2009, Pallinger and Menq 2021, Leveau et al. 2022).

It feeds mainly on small vertebrates (rodents, birds, lizards, snakes, fish, amphibians), as well as arthropods, the pulp of some fruits, and dead animals (Sick 1997, da Frota et al. 2021, Pallinger and Menq 2021). It has the behaviour of expelling some birds from their nest, such as the plumbeous ibis (*Theristicus caerulescens*), to prey on their eggs (Olmos 1990) and of capturing chicks that have fallen to the ground from heron and spoonbill nests (Sick 1997). Its nest is a platform of twigs and dry branches built high in trees, including palms, and almost always near rivers, lakes or swamps (Pallinger and Menq 2021). The reproductive period generally extends from June to May (van Dort 2020). In Minas Gerais, Southeast Brazil, nest construction was described as beginning between August and September, with incubation between September and October and chick development between November and December (Carvalho Filho et al. 2006). In Argentina, there are reports that these hawks build nests on artificial structures, such as telephone and high-tension poles (Olrog 1985).

In the state of São Paulo, Southeast Brazil, the great black hawk is found both on the coast, where it inhabits estuaries and mangroves, and inland, mainly along the largest rivers and lakes (Willis and Oniki 2003). It is uncommon in the Metropolitan Region of São Paulo (called throughout the text of Grande São Paulo), located between the coast and the interior of the state, which is considered the largest urban area in South America with more than 20 million inhabitants (IBGE 2023). Historical records of individuals were collected in Grande São Paulo in 1934 and 1935 (Pinto 1938, Willis and Oniki 2003).

Urban areas are expanding worldwide, and there is a need to understand how this human alteration affects biodiversity. Therefore, every day, new studies are investigating the presence, resilience, extinctions and impacts of urbanization on biodiversity worldwide, a topic that needs to be expanded and encouraged (Li et al. 2022). Given this scenario, we reviewed historical and current records of the great black hawk in Grande São Paulo and evaluated its occurrence status in this largest urban area in South America.

Material and Methods

Study area

The study area covers the Grande São Paulo, which encompasses 7,944 km^2 in the eastern part of the state of São Paulo, Southeast Brazil (Fig. 1). Covering 39 municipalities and with around 22 million inhabitants, it is the largest urban area in South America (EMPLASA 2022, IBGE 2023). Grande São Paulo has several water reservoirs of various sizes that make up the Alto Tietê watershed system (e.g., Billings, Guarapiranga), a very important water supply for the population. The region is part of the Atlantic Forest domain and is surrounded by native forests, forming a green belt that is part of the Atlantic Forest Biosphere Reserve (Costa 1997). The Southeastern and southern limits of Grande São Paulo are located at the top of the Serra do Mar (a slope of the plateau facing the Atlantic Ocean) and are parallel to the coast, with an average altitude of 800 m (Fig. 1). The climate is humid subtropical or warm temperate, and temperatures vary between 0°C in winter and above 27°C in summer (Alvares et al. 2013). Grande São Paulo receives many cold fronts, which are stronger during the austral winter, and sea breezes due to altitudes above 700 m and proximity to the ocean (Morais et al. 2010).

Secondary data

Records were gathered from scientific articles, books, and

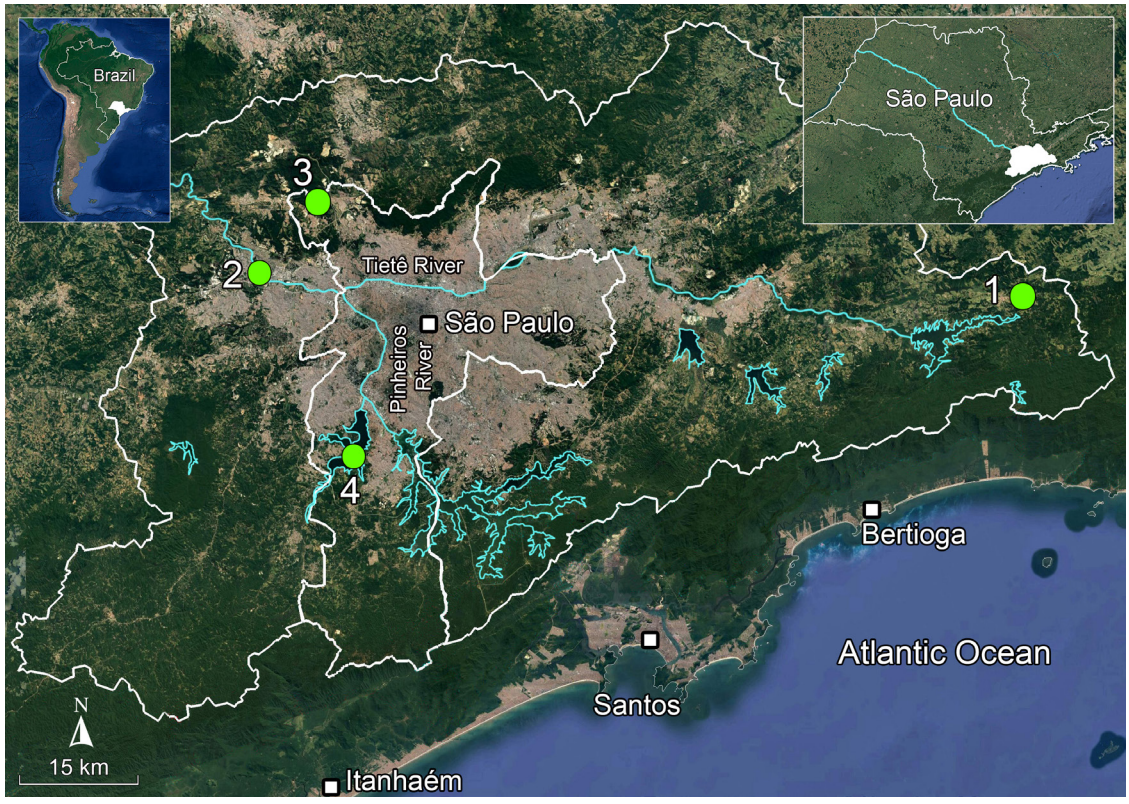

Fig.1. Map of records for great black hawk (*Buteogallus urubitinga*) in the Metropolitan Region of São Paulo in Brazil. The white area on the map of South America indicates the state of São Paulo, and that on the map of the state of São Paulo indicates the Grande São Paulo, with the Tietê River crossing the state. The white polygon within the limits of Grande São Paulo indicates the municipality of São Paulo. The polygons outlined in blue indicate medium and large water reservoirs. The two main rivers that cross the Grande São Paulo are Tietê and Pinheiros. Green circles indicate locations with recent records documented by photography and vocalization recording. Satellite images were taken from Landsat/Copernicus 2015.

Obr. 1. Mapa záznamov myšiaka vodného (*Buteogallus urubitinga*) v metropolitnej oblasti São Paulo v Brazílii. Biela plocha na mape Južnej Ameriky označuje štát São Paulo a biela plocha na mape štátu São Paulo označuje Veľké São Paulo, ktorým preteká rieka Tietê. Biely polygón v hraniciach Veľkého São Paulo označuje mesto São Paulo. Polygóny vyznačené modrou farbou označujú stredné a veľké vodné plochy. Dve hlavné rieky, ktoré pretekajú Grande São Paulo, sú Tietê a Pinheiros. Zelené krúžky označujú lokality s recentnými záznamami zdokumentovanými fotografiami a nahrávaním zvukov. Satelitné snímky pochádzajú z družice Landsat/Copernicus 2015.

grey literature (i.e., theses, dissertations, and technical reports). Digital databases, such as Web of Science (https://apps.webofknowledge.com), Scopus (https://www.scopus.com/home.uri) and Google Scholar (https://scholar.google.com/), were searched using combinations of the following keywords in Portuguese and English and using the Boolean operators "AND" and "OR": *Urubitinga urubitinga, Buteogallus urubitinga*, gavião-preto, great black hawk. Ornithological collections were checked through the online platform Global Biodiversity Information Facility (GBIF; https://www.gbif.org/), including the Museu de Zoologia da USP (MZUSP), the largest ornithological collection in the state of São Paulo and Brazil. Two data spreadsheets from the Centro de Estudos Ornitológicos (CEO; a non-governmental organization of the city of São Paulo) were consulted, one on the Neotropical Census of Waterbirds and the other from records made in the state of São Paulo (CEO 2021, 2024). Online scientific platforms such as Ornis (https://www.ornisnet.org) and SpeciesLink (https://www.splink.cria.org.br), online birdwatching platforms such as WikiAves (WA, https://www.wikiaves.com.br) and e-Bird (S/ML, https://ebird.org), and the wildlife sounds platform Xeno-Canto (https://xeno-canto.org/), were also consulted up to 10 December 2024. Only records with documentation were considered.

Primary data

Records were also obtained during ornithological work by the authors F.S. and A.F.A.M. in different locations within Grande São Paulo (mainly in the city of São Paulo) over the last three decades. The author A.F.A.M. is part of the Wildlife Division, a department of the city of São Paulo that has been monitoring biodiversity (especially birds) in the green areas of the city of São Paulo since 1993. Over the last 32 years, around 171 green areas have been and are being monitored, totalling around 1251 days and 4000 field hours. Data were partially published, for instance, in São Paulo (2023). The author F.S. has been studying birds in the Grande São Paulo since 2000 and, in the last 25 years, has visited dozens of locations, including carrying out some long-term studies and monitoring in the same locations, such as the Guarapiranga reservoir, where he has been conducting a continuous study for 25 years, totalling hundreds of days and thousands of field hours. Data obtained in the field have been made available in technical and scientific publications and on the eBird online platform.

Results

The bibliographic research only uncovered the records originally cited by Pinto (1938) and republished by Willis and Oniki (2003) of three individual great black hawks collected between 1934 and 1935 in Butantan in the western region of the city of São Paulo. However, the individual collected in January 1934 by Pinto (MZUSP 14553) was reidentified in 2009 by researcher Sergio Seipke as a juvenile white-tailed hawk (*Geranoaetus albicaudatus*). The two individuals from 1935 (MZUSP 17021 and 17022), donated by Mr. Cavalleiro, were juveniles and are no longer in the collection of the Museu de Zoologia da USP (L. F. Silveira pers. comm.). The search of digital databases produced one record available in CEO (2024) for the Ribeirão Pires region, but the authors did not confirm this (L. F. F. pers. comm.). The search carried out on online birdwatching platforms obtained nine records documented by photographs taken between 2018 and 2024 and made available on WikiAves, with two duplicate records on eBird. These records were made in two municipalities of Grande São Paulo — Salesópolis (east) and Barueri (west) (Fig. 1; Tab. 1). The data from the online platforms show solitary individuals, with eight records of adult birds and only one with juvenile plumage (WikiAves 2024). Among the records available on the eBird platform, 11 were not considered in the present study because they were not documented.

The field records of great black hawks made by the authors occurred in only two locations in the Grande São Paulo. In January and August 2023 at the Anhanguera Wildlife Refuge, a municipal reserve of approximately 800 ha located in the northern region of the municipality of São Paulo (data partially published in São Paulo 2023), and in September 2024 at Ilha dos Eucaliptos, a state reserve of 32 ha island located in the central part of the Guarapiranga Reservoir, an artificial reservoir inaugurated in 1908, in the southern region of the municipality of São Paulo (Mendes 2000) (Fig. 1; Tab. 1).

In the Anhanguera Wildlife Refuge, the authors A.F.A.M., L.B.Z., L.A.M., S.M.M., G.R.R. and R.M. recorded an adult individual in January 2023, vocalizing and flying over the region, coming from a flooded area of the Juqueri River, relatively close (S126451231, ML627729146). New auditory records, possibly of the same individual, were made in January and August 2023 (eBird: S127097852, S153152796) (Tab. 1). The recording site is bordered by native forest and eucalyptus (*Eucalyptus* spp.) groves, with dead eucalyptus trees. No nest was observed, nor was any reproductive behaviour of the observed individual.

On Ilha dos Eucaliptos, the authors F.S. and G.F.D. recorded an adult individual in September 2024, perched on a nest in construction approximately 20 m high in a dead/dry eucalyptus tree in an area of eucalyptus forest on the island (Fig. 2). The nest was already well built with thick branches. Yet, the bird was still picking up some thinner branches from the nest itself with its beak and arranging them on the main structure (Fig. 3). The individual was observed for approximately 30 minutes when it performed this behaviour and remained alert, as the nest was in a nesting area for waterbirds, such as the neotropic cormorant (*Nannopterum brasilianum*), cocoi heron (*Ardea cocoi*) and great egret (*Ardea alba*). Only the cocoi heron had active nests (under construction and with birds incubating) at the time. The observed great black hawk nest was approximately 6–12 m from the nearest cocoi heron nests. The great black hawk was not observed at the site nor in the region on a second visit three days later, and its nest was also no longer in the respective tree.

Discussion

Grande São Paulo is among the most ornithologically studied locations in Brazil, with approximately 200 years of data already produced on its birds (Pelzeln 1871, Ihering 1898, Pinto 1938, 1944, 1945, Willis and Oniki 2003, Schunck 2008, São Paulo 2023) and the largest number of bird watchers and photographers active in

Fig. 2. Location of the nest of the great black hawk (*Buteogallus urubitinga*) on Ilha dos Eucaliptos, Guarapiranga Reservoir, São Paulo. Nest location on the west bank of the island (red circle), high up in an Eucalyptus grove (A). Detail of the bird on the nest (red circle) and an indication of a cocoi heron (*Ardea cocoi*) nest on the left side, nearby (white asterix) (B).
Obr. 2. Poloha hniezda myšiaka vodného (*Buteogallus urubitinga*) na ostrove Ilha dos Eucaliptos, nádrž Guarapiranga, São Paulo. Umiestnenie hniezda na západnom brehu ostrova (červený kruh), vysoko v eukalyptovom háji (A). Detail vtáka na hniezde (červený kruh) a označenie hniezda volavky kokoi (*Ardea cocoi*) na ľavej strane, v blízkosti (biela hviezdička) (B).

Brazil (eBird 2024, WikiAves 2024). Thus, the great black hawk is not a species that could have gone unnoticed by naturalists, collectors, ornithologists, bird watchers and photographers who have in some way visited or resided in the region.

The existence of only 13 records made in the last six years (between 2018 and 2024) at four locations offers four following explanations: (1) the species is not a resident because the Alto Tietê Hydrographic Basin has small rivers, compared to those in the interior or on the coast of the state where it is common, in addition to environmental, climatic and ecological issues that may be involved; (2) the species may have been colonizing artificial wetlands (lakes and dams) of Grande São Paulo in recent years, as has been happening with the silver teal (*Spatula versicolor*), the green ibis (*Mesembrinibis cayennensis*), the bare-faced ibis (*Phimosus infuscatus*) and the great grebe (*Podicephorus major*) (Schunck et al. 2025), among others; (3) the species is a regional vagrant in Grande São Paulo, as already determined for several other species, such as the white-winged swallow (*Tachycineta albiventer*) (Dores et al. 2021), since some of the detected individuals were young and adults have not been observed in the same location for an extended period of time and/or (4) the species may be common around the Grande São Paulo and dispersed individuals

Fig. 3. Adult great black hawk (*Buteogallus urubitinga*) on the nest at Ilha dos Eucaliptos, Guarapiranga Reservoir, São Paulo (A). Detail of the bird and the nest (with a branch in its beak) (B).
Obr. 3. Dospelý jedinec myšiaka vodného (*Buteogallus urubitinga*) na hniezde v Ilha dos Eucaliptos, nádrž Guarapiranga, São Paulo (A). Detail vtáka a hniezda (s konárom v zobáku) (B).

Tab.1. Records of the great black hawk (*Buteogallus urubitinga*) obtained for the Grande São Paulo. The locality marked with an asterisk may not be correct and is attributed to the location of records with verified origin. Documentation column: MZUSP - Museu de Zoologia da USP and WA - WikiAves. Source Column: S - eBird Bird List.
Tab.1. Záznamy o myšiakovy vodnom (*Buteogallus urubitinga*) získané pre Grande São Paulo. Lokalita označená hviezdičkou nemusí byť správna a je priradená k lokalite záznamov s overeným pôvodom. Stĺpec s dokumentáciou: MZUSP - Museu de Zoologia da USP a WA - WikiAves. Zdrojový stĺpec: S - zoznam vtákov eBird.

N°	Locality	Geographic Coordinates	Altitude (m.a.s.l.)	Municipality	Date	Documentation	Author	Source
1	Museu da Energia - Usina Parque Salesópolis Salesópolis Sítio Macuquinho*	23°33'50.38"S 45°50'16.05"W	784	Salesópolis	7.9.2018	WA3108946, 3172221	Alberto Tamashiro, Vadi Tanaka	WikiAves
					1.5.2021	WA4291449	Roberto Shimizu	WikiAves
					26.7.2024	WA6232300	Mario Campagnoli	WikiAves
					4.8.2024	WA6254118	João Victor S. de Sá	WikiAves
					3.8.2024	WA6312947	Victor Bastos	WikiAves
2	Parque Ecológico do Tietê, Núcleo Ilha do Tamboré (Parque Ecológico do Tamboré)	23°28'56.91"S 46°52'18.07"W	721	Barueri	29.6.2022	WA4902163	Pedro Cristales, Edilson Pichiliani	WikiAves
					23.12.2022			
					6.4.2024	WA5215206	Edilson Pichiliani	WikiAves
					Not informed	WA6013307	Henrique Junior	WikiAves
						WA6117462	Leandro Moreira	WikiAves
3	Refúgio de Vida Silvestre Anhanguera, Trilha Lago das Garças/Paliteiro	23°24'46.70"S 46°47'31.29"W	795	São Paulo	18.1.2023	ML627729146 WA6612412	Anelisa Magalhães, Leticia B. Zimback, Lucas A. de Matos, Sylvia M. Matsuda	eBird (S126451231) Present study
					27.1.2023		Anelisa Magalhães, Leticia B. Zimback, Gisele R. Ruy, Rafaella da Mata	eBird (S129838879) Present study
					22.8.2023		Anelisa Magalhães, Leticia B. Zimback, Rafaella da Mata, Ravi A. Carmo, Estela Torres	eBird (S153152796) Present study
4	Represa do Guarapiranga, Ilha dos Eucaliptos	23°44'2.94"S 46°44'1.55"W	739	São Paulo	26.9.2024	Figures 2 and 3	Fabio Schunck, Gustavo F. Diniz	eBird (S197888964) Present study

try to colonize the favorable environments of this region, as presented by Leveau et al. (2022) in Argentina.

The records made at the Anhanguera Wildlife Refuge are the first for the municipality of São Paulo and show a different type of occurrence in smaller artificial lakes, which has not been previously detected in this area. Suppose it was the same individual that was detected on all three occasions, mainly between January and August, then the pattern is similar to that observed at other locations, with birds that seem to spend a few months in the same area, probably due to the availability of food or for recovery in the case of regional vagrant individuals. The record made on Ilha dos Eucaliptos is very striking, both because it was of a bird with a nest, being the first documented record for the state of São Paulo, where its reproduction was speculated (Willis and Oniki 2003) and because it was located in a waterfowl nesting area, an important source of food for the species (e.g., eggs and heron chicks) (Olmos 1990, Sick 1997). The date of the record (September) and the behaviour of arranging the branches of the nest coincide with the nest-building period reported by Carvalho Filho et al. (2006) in Minas Gerais.

Most of the current records of the great black hawk for Grande São Paulo were made in flooded areas, such as lakes and reservoirs associated with the Pinheiros and Tietê rivers. However, there are several locations (mainly reservoirs) with suitable habitats that do not yet have records of the species, which need to be visited and monitored in the future.

We also highlight the importance of carrying out monthly monitoring programs for birds in Grande São Paulo, since the record made at the Anhanguera Wildlife Refuge was part of the "Inventory and Monitoring of

Wildlife in the Municipality of São Paulo" program carried out by the Divisão da Fauna Silvestre (DFS) of the City of São Paulo continuously since 1993 (São Paulo 2023). The record made on Ilha dos Eucaliptos was part of a monthly monitoring of aquatic and migratory birds carried out at the Guarapiranga reservoir by the author F.S. and collaborators.

Although incomplete, the great black hawk breeding record in the Grande São Paulo is noteworthy for being the first documented nest for the state of São Paulo, where the species is widely found and has been frequently recorded. Breeding in the state by the species was predicted by Willis and Oniki (2003). Still, among the 957 images of the species available on the two main online platforms (749 on WikiAves and 208 on eBird), only records of mating birds (e.g., ML488978891) and young birds of different ages (e.g., ML176955661, 6230001901) were found. The record of the nest on Ilha dos Eucaliptos and the online data support the possibility of breeding in São Paulo state. It would be essential to map the locations with data on reproductive behaviour and the presence of young birds so that nests can be found and monitored in the future. This type of information is scarce for this species, especially in Southeast Brazil, and essential for conservation actions.

Records made by birdwatchers and photographers are essential for carrying out this type of monitoring and for understanding the occurrence of the great black hawk in Grande São Paulo over time. However, 11 of all the records available on the eBird platform were not considered in the present study, as they were undocumented (eBird 2024). Since this species, whether in adult or juvenile plumage, can easily be confused with other species of hawks that occur in the same environments, such as the snail kite (*Rostrhamus sociabilis*) and Harris's hawk (*Parabuteo unicinctus*), we cannot be certain about these identifications. However, if accurate, they may indicate that the species is more common than previously thought. Therefore, we recommend that all records of the great black hawk (and other species, including hawks) made in Grande São Paulo be documented and posted on online birdwatching platforms. We also advise that exact locations be provided, as some records made in Salesópolis may have the wrong location due to the observer having visited one area but made the record in another.

The occurrence of the great black hawk in the wetlands and flooded areas of Grande São Paulo, whether natural or artificial, draws attention to the existence of this type of environment in the vicinity of the largest urban area in South America. It also calls attention to the need to expand the protection of these habitats, mainly by creating conservation units in the floodplains associated with the Tietê River. These environments are essential for conserving the entire community of birds related to the wetlands of Grande São Paulo, including dozens of endangered species.

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Recieved: 8.2.2025
Accepted: 17.4.2025