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RURAL SETTLEMENTS AND WILDLIFE SIGHTINGS

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ABSTRACT

The objective of this article is to identify relationships between the sighting of fauna in rural settlements of agrarian reform and possible scenarios of the realities experienced in the states of Mato Grosso and Mato Grosso do Sul. Specifically, we sought to relate the sighting of fauna with the list of endangered animals in the states of Mato Grosso and Mato Grosso do Sul. The methodology was based on information provided by family farmers about sightings that occur on their lot, for which it seeks to establish relationships with the scenarios of fauna on a macro (biomes) and micro (surroundings) scale. The results show that greater relevance is given to the sighting of birds and mammals, animals called mediatic. In addition, it was obtained the description of four scenarios that seek to establish relationships between abundance or not of forest fragments and economic losses due to the attack of animals in the fields in search of food, thus concluding that deforestation and replacement of native forest by agriculture without due environmental concern can cause negative impacts both for nature and for the economy.

Keywords: Sighting scenarios, Endangered fauna, Circumstances of the sighting.

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Revista ARACÊ
ISSN: 2358-2472

INTRODUCTION

Rural settlements represent a significant part of the rural environment of the Brazilian territory. There are 404,993 titling documents issued to families in the countryside until August 2022 (INCRA, 2022), residing in all regions of the country. The different realities involving rural settlements occur due to the time of implementation, accessibility and transport infrastructure of production, proximity to consumer centers, quality and different profiles of soils and reliefs, access to water, as well as the associative and cooperative relationships that are established in the community.

Equally important, when it comes to the economic and social sustainability of the settlements, are the conflicts of access to land: land grabbing, violence in the countryside and loss of crops are factors that generate difficulties in permanence in the lots. Another issue of relevance is centered on the relationship between wild animals and production, whether animal or vegetable. This relationship has positive points, such as bees that are pollinators (Kerr *et al*., 2001); Therefore, wildlife is an important element for the maintenance of biodiversity. However, due to the reduction of the distribution area of several animals to isolated forest fragments, resulting in food scarcity, many animals have advanced to the gardens, generating, in some cases, significant losses of production in the lots.

The rural areas of the states of Mato Grosso and Mato Grosso do Sul are marked by agribusiness actions with extensive soybean, sugarcane, cotton plantations, among other monocultures that, combined with cattle ranching, contribute to high deforestation rates. According to Mapbiomas (2022), agriculture accounted for 1,969,095 ha, or 95.7% of the total of 2,057,250 ha deforested in Brazil in 2022, with the state of Mato Grosso occupying third place in the national *ranking*, with 11.62% of the deforested area (239,144 ha). Deforestation that overlapped with rural settlement areas accounted for 17% of the total deforested area in Brazil in 2022. The Amazon biome had the highest concentration of deforested area in rural settlements (295,402 ha, 95%).

The territory of Mato Grosso is occupied by portions of the Amazon, Cerrado and Pantanal biomes; the southern territory of Mato Grosso is occupied by the Cerrado, Atlantic Forest and Pantanal biomes. When verifying the deforestation situation in each of these biomes, MapBiomas states that, of the total deforestation events in 2022, 62.1% occurred in the Amazon biome, with 1,192,635 ha deforested (58% of the total deforested area in the country), followed by the Cerrado with 8.3% (32.1% of the area) and 659,670 ha. In the

Revista ARACÊ
ISSN: 2358-2472

Atlantic Forest, 30,012 ha were deforested, which represents 1.5% of the total deforested area in the country.

Deforestation contributes to severe environmental imbalances, among which we can highlight the changes in the food chain of wild fauna with the decrease in the availability of food, influences on migration, both of terrestrial and aquatic fauna, disappearance and extinction of native species. According to Souza (2002, p. 03), fauna plays a fundamental role in maintaining environmental balance, since it acts directly in the pollination of a wide variety of plant species, ensuring the fertilization of more species, acts in seed dispersal, in the maintenance of different wild populations, in pest control, among many other benefits. Thus, a good knowledge of the fauna of a region can provide important subsidies to understand the context of local biodiversity and, consequently, to have a notion of the harm arising from environmental imbalances.

Supported by the problem described, the present study aims to identify relationships between the sighting of fauna in rural settlements of agrarian reform with possible scenarios of the realities experienced in the states of Mato Grosso and Mato Grosso do Sul. Specifically, we sought to relate the sighting of fauna to the list of endangered animals present in the states of Mato Grosso and Mato Grosso do Sul, based on the SALVE Platform (Brazil, 2022) and the Red Book of Brazilian Fauna Threatened with Extinction by ICMBio (2018). Data collection was carried out within the scope of the Diagnostic Project for Environmental Regularization of Agrarian Reform Settlements of the Federal University of Mato Grosso (RADIS/UFMT), in partnership with the Institute of Colonization and Agrarian Reform (INCRA).

METHODOLOGY

The RADIS/UFMT project carried out visits to agrarian reform settlements and recorded socioeconomic and environmental data for the purpose of diagnosing agrarian systems in the years 2021 and 2022. The settlements visited were determined by INCRA, constituting the sample of Tables 1 and 2, identified as they are inserted in the mesoregions of each state, systematization scale and analysis selected by the RADIS/UFMT project. Settlements located in more than one mesoregion were counted based on the one in which the settlement in question had the largest area (Figures 1 and 2). It is noteworthy that the number of settlements surveyed in the state of Mato Grosso do Sul is lower due to the

Revista ARACÊ
ISSN: 2358-2472

demand established by INCRA itself. No settlements in the Pantanal biome, in Mato Grosso do Sul, were surveyed.

Table 1 – Identification, date of creation of the settlements surveyed in Mato Grosso

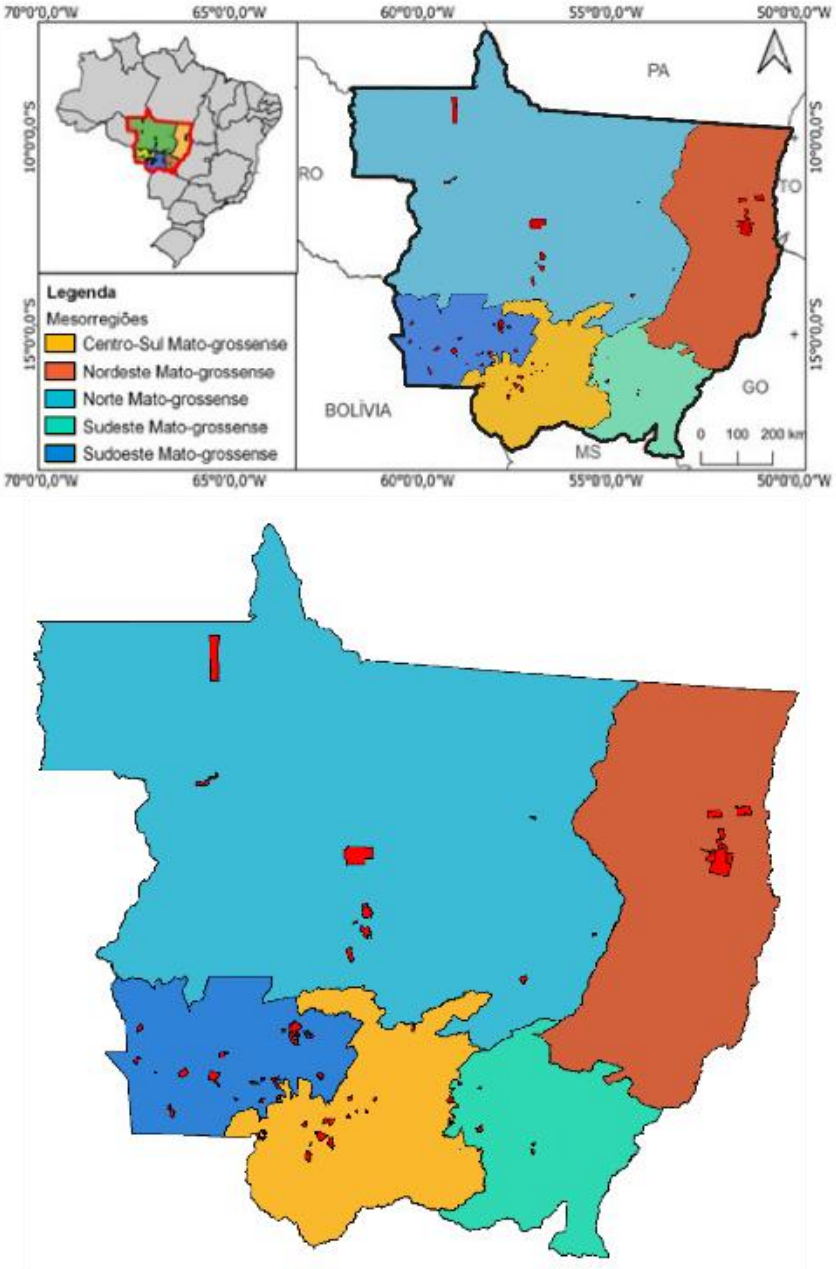
Caption	Settlement	Total Lots	Creation Date
1	PA NOVA COTRIGUAÇU	1.632	22/09/1995
2	PA IRACEMA	359	14/08/1996
3	PA TAPURAH/ITANHANGA	1.199	29/12/1995
4	PA PONTAL DO MARAPE	359	31/12/1998
5	PA POUSO ALEGRE	47	02/04/2001
6	PA SANTANA DÁGUA LIMPA	378	29/07/1999
7	PA CAMPINAS	253	06/11/1997
8	PA SONHO DE ANDERSON	54	02/08/2010
9	PDS NOVA ALIANÇA	87	22/09/2009
10	PA COLORADO	180	26/07/1999
16	PA MACIFE II	237	29/11/1995
17	PA MACIFE	972	15/08/1995
18	PA MACIFE III	129	20/11/2020
23	PA SANTO ANTONIO DA FARTURA	267	04/06/2001
24	PA PONTAL DO GLÓRIA	100	14/02/2000
25	PA RIBEIRÃO DA GLÓRIA	38	25/01/1999
27	PA FRANCISCO JOSÉ NASCIMENTO	104	02/08/2001
28	PA ESTRELA DO ORIENTE	88	31/07/1998
29	PA CAMPO LIMPO	49	12/02/1998
30	PA FURNAS DO BURITI	28	30/05/1997
31	PA SANTA FILOMENA	113	10/09/2004
32	PA SADIA VALE VERDE	436	26/05/1994
33	PA FACÃO/BOM JARDIM	199	05/12/2007
34	PA RECOMPENSA II	20	26/12/1996
35	PA PAIOL	233	11/06/1996
36	PA LIMOEIRO	168	13/12/2001
37	PA LARANJEIRA II	37	10/04/2012
38	PA IPÊ ROXO	30	31/12/1998
39	PA LARANJEIRA I	131	18/01/1999
40	PA NOSSA SENHORA DA ESPERANÇA	105	11/09/2002
41	PA BARRANQUEIRA	80	14/08/2000
42	PA RANCHO DA SAUDADE	47	19/12/1997
43	PA BOM SUCESSO	14	18/12/2002
44	PA CORIXO	73	28/10/2008
45	PA SAPICUÁ	38	30/08/1999
46	PA NOVA ESPERANÇA	51	10/08/2000
47	PA JATOBÁ	29	10/08/1998
48	PA KATIRA	47	17/09/1996
49	PA CORGÃO	175	21/12/2005
50	PA MIRASSOLZINHO	741	20/11/2001
51	PA PAPIRO	30	16/11/2005
52	PA MIRASSOLZINHO II	72	17/12/2002
53	PA FLORESTAN FERNANDES	160	27/11/2006
54	PA SANTA ROSA I	73	03/05/2005
55	PA TRIANGULO	140	23/12/1999
56	PA ANTONIO CONSELHEIRO	1.003	25/06/2001
57	PA VALE DO SOL	52	22/12/2000
58	PA RIO BRANCO	86	23/12/1998
59	PA USIEL PEREIRA	57	07/03/2007
60	PDS NOVA CONQUISTA	68	26/07/1999

Revista ARACÊ
ISSN: 2358-2472

61	PA RIOZINHO	72	18/01/1999
62	PA CABAÇAS	164	24/10/1997
63	PA SANTA HELENA II	54	28/02/2002
64	PA ROSELI NUNES	335	13/12/2001
65	PA MARGARIDA ALVES	152	22/03/2007
66	PA SILVIO RODRIGUES	160	30/06/1998
67	PA RITINHA	135	21/03/2006
68	PA SERINGAL	242	24/10/1997
69	PA SÃO SEBASTIÃO	15	29/04/1998
70	PA RIO ALEGRE	344	26/12/1996
71	PA TRIUNFO	318	13/12/2001

Source: RADIS, 2022.

Figure 1 - Distribution of the surveyed settlements by mesoregion of the state of Mato Grosso



*Information on the settlements listed is available in Table 1.
Source: RADIS, 2022.

Revista ARACÊ
ISSN: 2358-2472

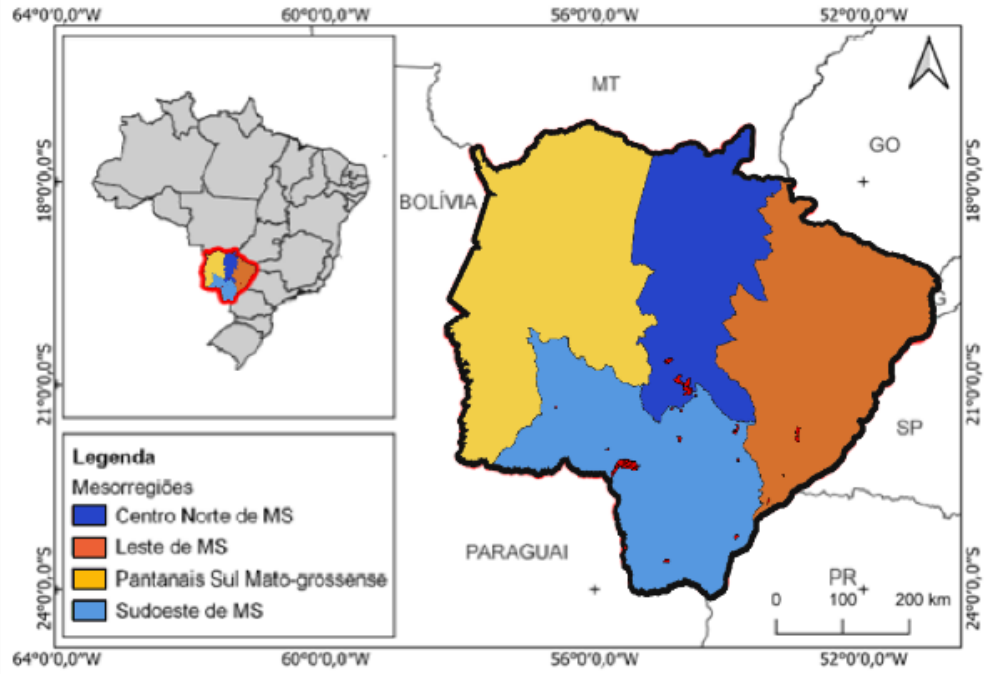
Table 2 - Identification, geopolitical location and date of creation of the settlements surveyed in Mato Grosso do Sul

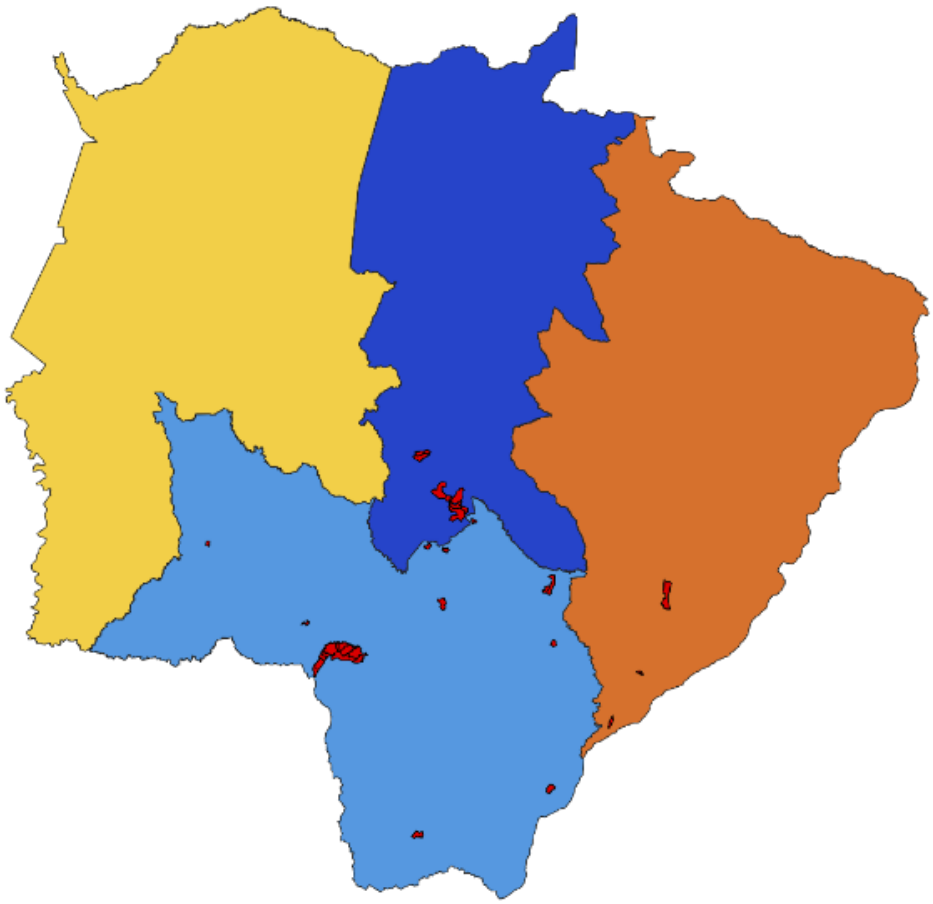
Legend	Settlement	Total Lots	Creation Date
1	PA SANTA LÚCIA	36	09/03/2007
2	PA ABA DA SERRA II	17	24/12/2007
3	PA ABA DA SERRA I	38	05/12/2007
4	PA ITAMARATI II FETAGRI	589	30/09/2004
5	PA ITAMARATI II CUT	270	30/09/2004
6	PA PAM	117	23/12/1998
7	PA ITAMARATI II FAF	150	30/09/2004
8	PA ITAMARATI II MST	569	30/09/2004
9	PA ITAMARATI II FAFI	116	30/09/2004
10	PA BELA MANHÃ	102	11/11/2005
11	PA ITAMARATI - CUT	281	29/12/2000
12	PA ITAMARATI - MST	320	29/12/2000
13	PA ITAMARATI - AMFFI	150	29/12/2000
14	PA ITAMARATI - FETAGRI	399	29/12/2000
15	PA ÁGUA VIVA	280	27/11/2006
16	PA ITAQUIRAÍ	255	17/07/2007
17	PA TAQUARA	67	10/08/1998
18	PA LAGOA AZUL	117	27/12/2005
19	PA SÃO JUDAS	187	09/10/1998
20	PA VOLTA REDONDA CUT	150	30/10/2007
21	PA SANTA LUZIA	70	30/10/2007
22	PA ANGÉLICA	120	12/07/2005
23	PA SÃO JOÃO	58	11/03/1996
24	PA ELDORADO	621	15/07/2005
25	PA ALDEIA	217	03/09/1998
26	PA SANTA MÔNICA - MST	166	07/12/2005
27	PA SANTA MÔNICA - CUT	89	07/12/2005
28	PA SANTA MÔNICA - FETAGRI	462	07/12/2005
29	PA ELDORADO II	778	27/12/2005
30	PA ALAMBARI - FAF	204	27/12/2005
31	PA ALAMBARI - CUT	230	27/12/2005
32	PA GIBÓIA	238	11/07/2000
33	PA ALAMBARI FETAGRI	156	27/12/2005

Source: RADIS, 2022.

Revista ARACÊ
ISSN: 2358-2472

Figure 2 - Distribution of the settlements surveyed by mesoregion in Mato Grosso do Sul





*Information on the settlements listed is available in Table 2.
Source: RADIS, 2022.

Revista ARACÊ
ISSN: 2358-2472

Fauna sighting is an indicator that allows us to understand more about the extinction of animals, as well as the overpopulation of species due to the absence of natural predators. Therefore, the objective of this study is to relate the sighting of fauna with the list of endangered animals present in the states of Mato Grosso and Mato Grosso do Sul, based on the SALVE Platform (ICMBio, 2022) and the Red Book of Endangered Brazilian Fauna (ICMBio, 2018), as shown in Table 1. It should be noted that this list was prepared with the aim of relating sightings of wildlife and endangered species.

Table 1 – Endangered species in the biomes of Mato Grosso and Mato Grosso do Sul

Classes	Scientific Name	Common Name	Bioma
MAMMALS	*Panthera Onca*	canguçu, canguçu, jaguar, jaguaretê, jaguar, jaguar, tiger, yaguaretê	Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal
	Priodontes maximus	Tatu-açú, Tatu-canastra	Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal
	Natalus macrourus	Brazilian funnel-ear bat	Amazon, Caatinga, Cerrado, Marinho, Atlantic Forest
	Ctenomys bicolor	Rato-paca, Tuco-tuco	Amazon, Cerrado
	Lonchophylla dekeyseri	Cerrado bat	Cerrado, Atlantic Forest
	Lagothrix lagothricha cana	Macaque-potbellied	Amazon, Cerrado
	Myrmecophaga tridactyla	Flag, Bandurra, Jurumi, Jurumim, Papa-ants, Tamanduá-açú, Tamanduá-flag	Amazon, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
	Charming atheles	Coatá, Black Coatá, Spider Monkey, Black-faced Spider Monkey	Amazon, Cerrado, Pantanal
	Blastocerus dichotomus	Marsh deer	Amazon, Cerrado, Atlantic Forest, Pampa, Pantanal
	Tapirus terrestres	Tapir, Brazilian tapir	Amazon, Caatinga, Cerrado, Marinho, Atlantic Forest, Pantanal
	Tayassu finder	White-lipped peccary, peccary, portion, wild pig	Amazon, Caatinga, Cerrado, Marinho, Atlantic Forest, Pantanal
	Chrysocyon brachyurus	Maned wolf, Wolf, wolf, Wolf, mane wolf, Mane wolf, Mane wolf, Maned wolf, Maned wolf, Maned wolf, Red wolf, Red wolf	Amazon, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
	Speothos venaticus	bush dog	Amazon, Cerrado, Atlantic Forest, Pantanal
	Inia geoffrensis	Dolphin, Pink Dolphin, Pink Dolphin, Amazon Dolphin, Red Dolphin, Red Dolphin	Amazon, Cerrado
	Inia araguaiaensis	Araguaia river dolphin	Amazon, Cerrado

Revista ARACÊ
ISSN: 2358-2472

POULTRY	*Sporophila hypoxantha*	Red-bellied Seedeater	Cerrado, Atlantic Forest, Pampa, Pantanal
	Sporophila palustres	White-snouted Seedeater	Amazon, Cerrado, Atlantic Forest, Pampa, Pantanal
	Sporophila ruficollis	Dark-snouted Seedeater	Cerrado, Pampa, Pantanal
	Tigrisoma fasciatum	Socó-Boi-Escuro, Socó-Jararaca	Amazon, Cerrado, Atlantic Forest
	Laterallus xenopterus	Sanã-de-cara-ruiva, sanã-se-cara-ruiva	Cerrado, Atlantic Forest
	Boring cujubi	Cajubi, Cajubim, Cox, Cujubi, Cujubim, Jacubim, Jacutinga	Amazon, Cerrado, Pantanal
	Celeus obrieni	- Pica-pau-do-parnaíba, Pica-pau-do-parnaíba	Amazon, Cerrado
	Conothraupis mesoleuca	Tiê-bicudo, Tiê-bicudo	Amazon, Cerrado
	Geositta poeciloptera	Wanderer, Wanderer, Curriqueiro, Curriqueiro	Cerrado, Atlantic Forest
	Coryphaspiza melanotis	black-mask-tico-tico	Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal
	Hypocnemis lateralis	singer-ochraceous	Amazon, Cerrado, Pantanal
	Rhegmatorhina hoffmannsi	Mother-of-taoca-papuda	Amazon, Cerrado
	Calidris canutus	Red-snouted Sandpiper	Amazon, Caatinga, Cerrado, Marinho, Atlantic Forest, Pampa, Pantanal
	Calidris pusilla	Flat-sandpiper	Amazon, Caatinga, Cerrado, Marinho, Atlantic Forest, Pampa, Pantanal
	Westbiting coronata	Gray eagle	Amazon, Caatinga, Cerrado, Atlantic Forest, Pantanal
	The 2016-2008 World No.	Seedeater	Amazon, Cerrado, Pantanal
	Capito dayi	Cinta captain	Amazon, Cerrado
	Hylexetastes uniformis	arapaçu-uniforme, arapaçu-uniforme	Amazon, Cerrado
	Hypocnemis striata	Striated Singer, Striated Singer	Amazon, Cerrado
	Lophornis gouldii	Topetinho-do-Brasil-Central, Topetinho-do-Brasil-Central	Amazon, Cerrado, Marine
	Psophia dextralis	- Jacamim-de-costas-marrons, Jacamim-De-Costas-Marrons	Amazon, Cerrado
	Pyrrhura pallescens	Madeiran Tiriba	Amazon, Cerrado
	Tinamus tao	azulona	Amazon, Cerrado, Pantanal
	Pyrrhura anerythra	Very much	Amazon, Cerrado
	Sporophila maximiliani	Pointy	Amazon, Cerrado
REPTILES	*Ameiva parecis*	Calango	Amazon, Cerrado
	Bachia didactyla	Legless lizard	Amazon, Cerrado

Source: Platform SALVE (BRASIL, 2022) and ICMBIO (2018).

By observing Table 1, it is possible to identify that the settlements studied in the state of Mato Grosso were created between 1994 and 2007, being, in their majority, from the 1990s. Furthermore, there is also a discrepancy in the number of lots per settlement, ranging from 14 to 1,199 lots, that is, relatively small settlements if related to the fiscal modules and the land structure of Mato Grosso (NERA, 2021). In Table 2, the data from the

Revista ARACÊ
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state of Mato Grosso do Sul illustrate the same discrepancy regarding the number of lots, with settlements ranging from 17 to 778 lots, which were mostly created in the 2000s, with few created in 1998 and others in 2007. It is not objective to analyze such elements, however such information reveals that public policies for agrarian reform have been conducted differently over the decades. Before, more settlements were created and little was invested in infrastructure for permanence in the countryside. Over time, policies have been promoting investments in infrastructure to maintain settlers in the countryside (Lima *et al.,* 2020).

After systematization, the information generated infographics that show some realities about the sighting of fauna, identifying, in particular, the classes of animals: birds, mammals and reptiles. These classes are more noticeable to the human eye and, consequently, cause visual impact. Souza (2002, p. 03) points out that "fauna plays a fundamental role in maintaining balance, allowing the fertilization of more species, seed dispersal, pollination, maintenance of wild populations and pest control". And, through them, it is possible to understand the context of biodiversity and environmental imbalances.

RESULTS AND DISCUSSION

FAUNA SIGHTING AND ITS INDICATORS

One of the indicators of environmental sustainability is linked to fauna. Animals in their natural environments contribute to the maintenance of biodiversity, as well as to the continuity of the ecosystems in which they live. Nascimento and Campos (2011) state that, in the fauna, composed of birds, mammals, amphibians, reptiles, fish, terrestrial invertebrates and aquatic invertebrates, the latter are not treated equally, as there is a concern with the "charismatic fauna". This fauna is composed of birds and mammals, which shows a "lesser importance" in relation to other individuals and their roles in maintaining biodiversity.

Venomous animals, such as snakes, are culturally abolished and vandalized when sighted, due to the number of accidents resulting from their presence (Souza; Lucena, 2022). In this context, the sighting of fauna makes it possible to understand some issues and envision scenarios of environmental preservation and conservation.

When observing the rural reality of wildlife sightings in the surveyed settlements in the state of Mato Grosso (Figure 3), the number of sightings reaches 122,197 records. Of these, the Amazon biome has 51.39% of responses focused on mammals; 26.89% of birds

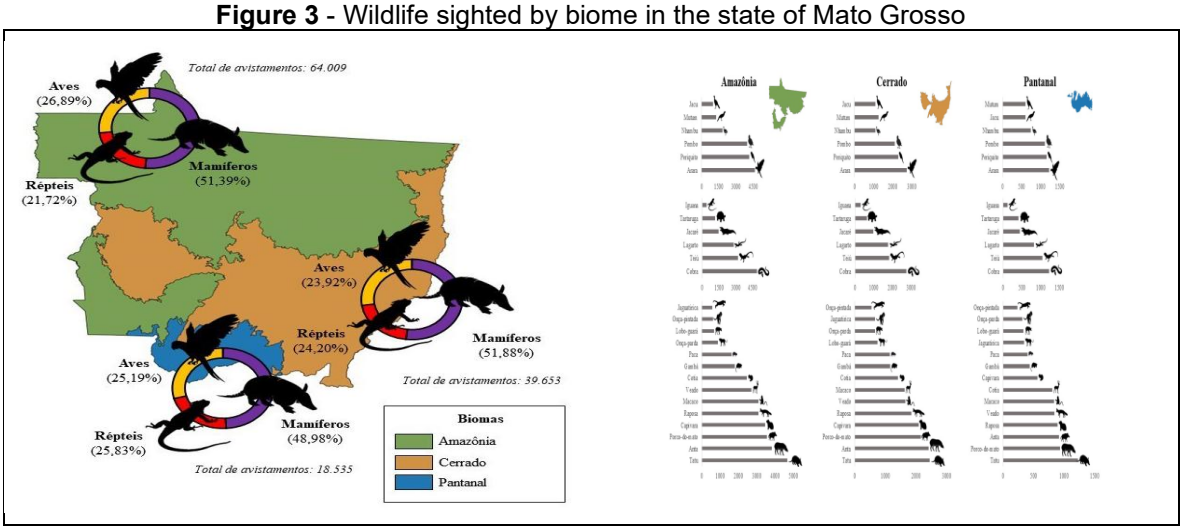
Revista ARACÊ
ISSN: 2358-2472

and 21.72% of reptiles. In the Cerrado biome, the sightings are of mammals (51.88%), reptiles (24.20%) and birds (23.92%). In the Pantanal, there were 48.98% sightings of mammals, 25.83% sightings of reptiles and 25.19% of birds. It should be noted that the Pantanal is known worldwide for its diversity of birds and fish, however it is necessary to highlight that most of the lots visited in the Pantanal region are not necessarily in flooded areas, where there is a great abundance of birds, but on dry land.

When the same reality is observed through the organization of the mesoregions, Figures 4 and 5 allow us to analyze some interesting aspects from their respective dimensions. The North, Northeast, Center-South, Southeast and Southwest mesoregions of Mato Grosso, in general, have a higher number of mammal sightings and fewer reptiles. It is observed that, in the northern mesoregion of Mato Grosso, the sighting of mammals is 51.39%, birds is 26.89% and reptiles 20.11%. In the Northeast of Mato Grosso, the sighting of mammals is 52.01%, birds is 26.24% and reptiles 21.74%. In the Center-South of Mato Grosso, the sighting of mammals is 50.96%, birds is 27.93% and reptiles 21.11%. However, observing the Southeast Mato Grosso mesoregion, the sighting of mammals is 46.14%, birds is 31.64% and reptiles 22.23% and, in the Southwest Mato Grosso mesoregion, the sighting of mammals is 50.51%, birds is 27.33% and reptiles is 22.16%, which there is a pattern in observations, always with a predominance of mammals, followed by birds and reptiles. Among the species of animals sighted, the popular name is used here to facilitate the understanding of their richness. The most sighted mammals were: opossums, armadillos, monkeys, maned wolves, foxes, pumas, jaguars, ocelots, tapirs, wild pigs, deer and capybara rodents, agoutis, pacas and rats. The birds were: nhambus, pigeons, curassows, guans, macaws, parakeets. The most cited reptiles are: turtles, lizards, tegus, iguanas and alligators.

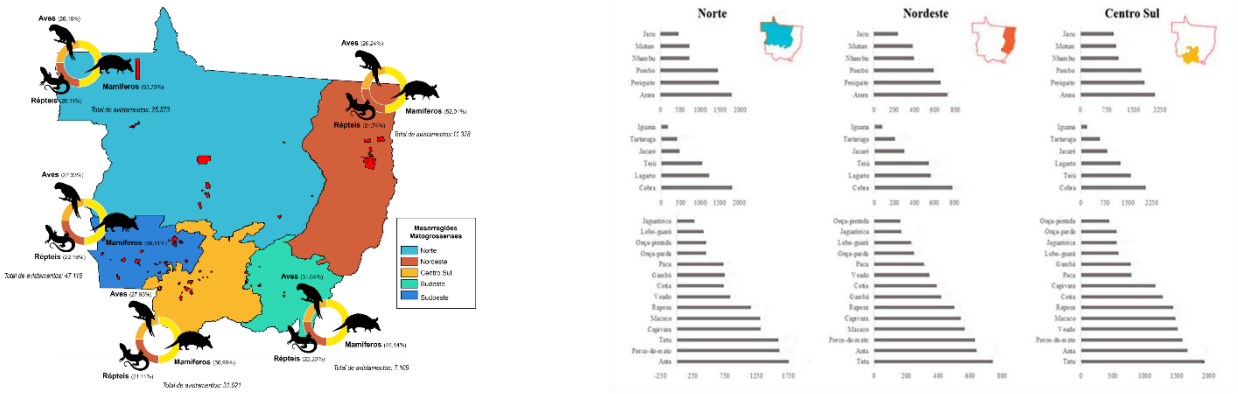
Revista ARACÊ
ISSN: 2358-2472

Figure 3 - Wildlife sighted by biome in the state of Mato Grosso



Source: RADIS, 2022.

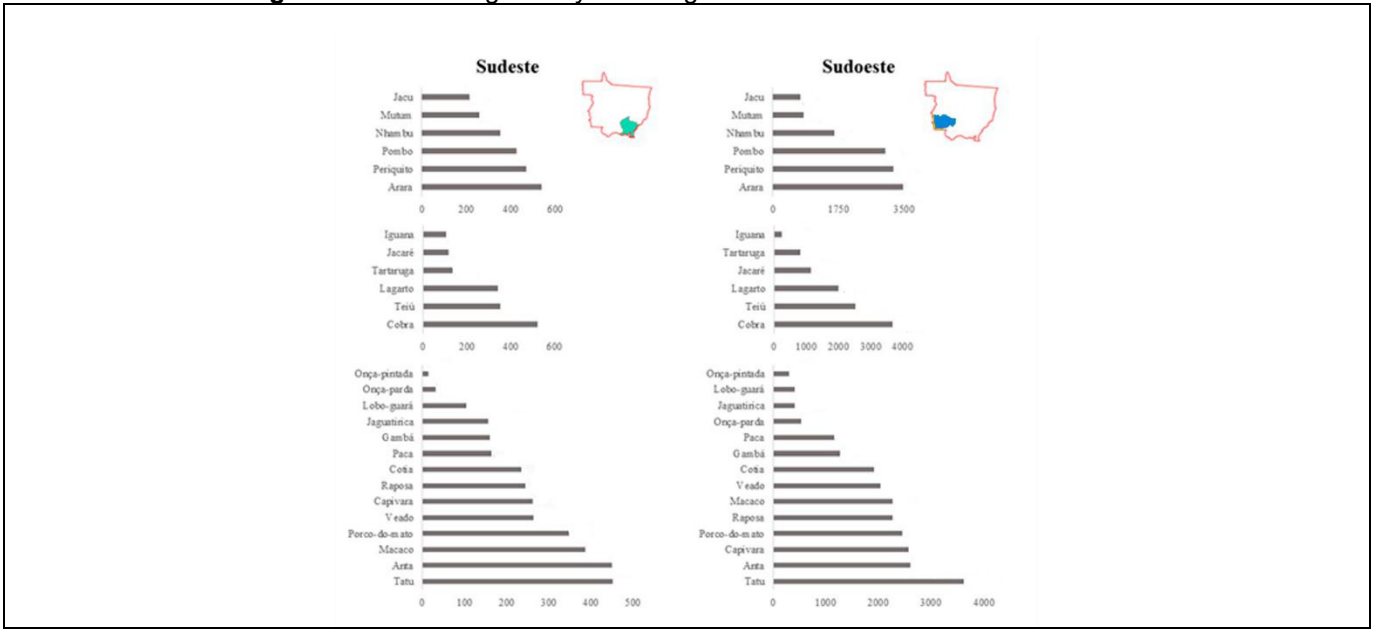
Figure 4 - Wildlife sighted by mesoregion in the state of Mato Grosso



Source: RADIS, 2022.

Revista ARACÊ
ISSN: 2358-2472

Figure 5 - Wildlife sighted by mesoregion in the state of Mato Grosso



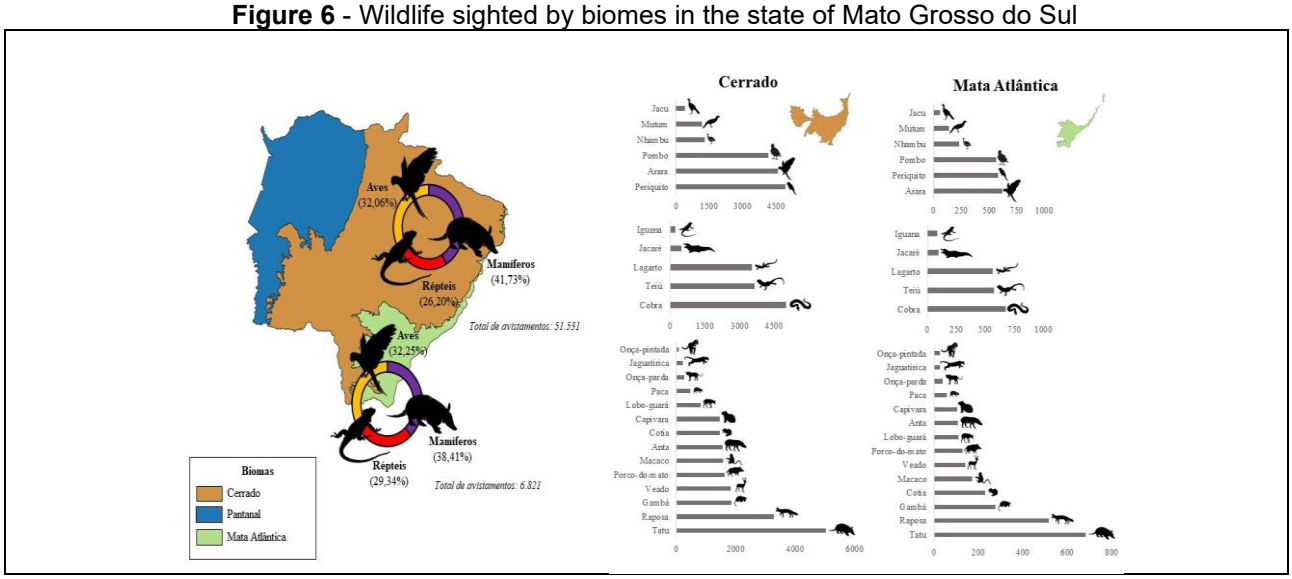
Source: RADIS, 2022.

When analyzing the state of Mato Grosso do Sul, the RADIS/UFMT Project visited settlements located in the Cerrado and Atlantic Forest biomes. Figure 6 identifies in the Cerrado biome the highest number of sightings of mammals (41.73%), followed by sightings of birds (32.06%) and reptiles (26.20%). It should be noted that the least sighted mammal was the jaguar, an important animal at the top of the food chain that helps in the natural control of animals that most attack the swiddens of settlers such as capybaras and wild pigs (Domitian *et al.*, 2020). However, it should always be borne in mind that these big cats are numerically inferior to their prey, which are animals, often foragers. In addition, there are other aspects inherent to these organisms, which are more difficult to observe, at least in situations that do not involve, for example, the offer of cevas, common in some places in the Pantanal, aiming to attract these animals for sighting with tourists, an illegal but recurrent practice.

Figure 7 shows that the wild fauna sighted in the state of Mato Grosso do Sul is systematized by mesoregion with the following results: Central-North of Mato Grosso do Sul with sightings of 42.63% of mammals, 31.80% of birds and 25.57% of reptiles. In the Eastern mesoregion of Mato Grosso do Sul, the sighting of mammals was 52.01%, birds was 26.24% and reptiles was 21.74%. In the mesoregion of Southwest Mato Grosso do Sul, the sighting of 52.01% was of mammals, 26.24% of birds and 21.74% of reptiles.

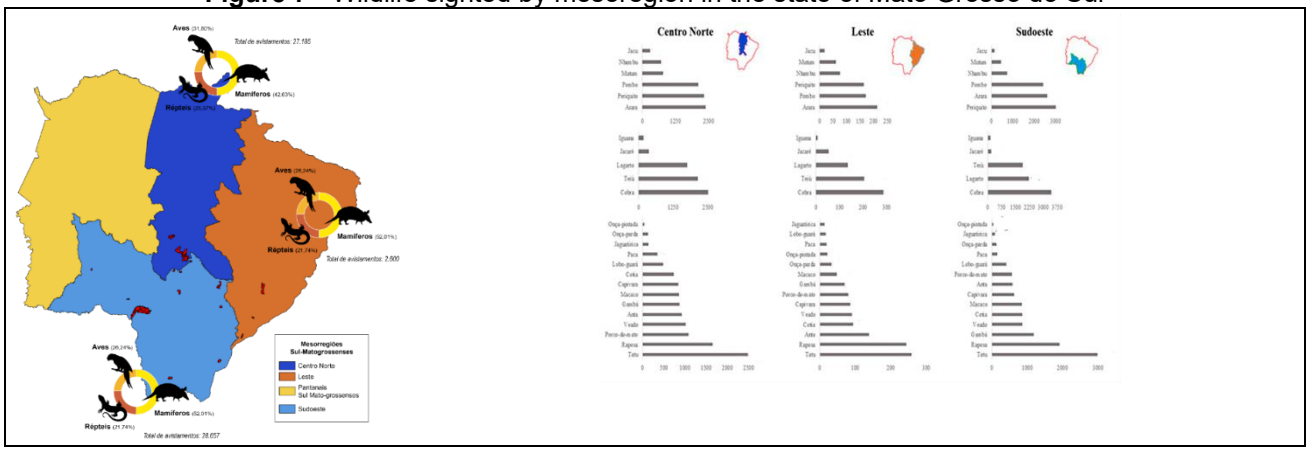
Revista ARACÊ
ISSN: 2358-2472

Figure 6 - Wildlife sighted by biomes in the state of Mato Grosso do Sul



Source: RADIS, 2022.

Figure 7 - Wildlife sighted by mesoregion in the state of Mato Grosso do Sul



Source: RADIS, 2022.

The recording of information on the sighting of fauna in rural settlements also emerges as an important facet of what is now known as citizen science, which, in practice, is nothing more than a partnership between scientists and ordinary people from a given community or region, in a certain way amateurs, in the collection of data that can become solid sources of information for scientific research.

The collection methodologies used in the RADIS project are characterized by involving the settled beneficiaries of agrarian reform, with their own empirical knowledge acquired in the field throughout their experiences, field technicians, information collectors and researchers, teachers who seek to analyze and organize the information obtained in order to make it useful and subject to dissemination and use by the general public as well as by professionals. This data can then foster and expand public participation in

Revista ARACÊ
ISSN: 2358-2472

environmental management, allowing anyone, anywhere, to be a "source of information", thus, this methodology allows access to a vast amount of information with little investment.

In this sense, the information obtained by the RADIS UFMT collection methodology can contribute to the identification of realities linked to environmental imbalances caused by deforestation and habitat fragmentation, fires, water contamination and pollution in general. The responses of family farmers showed that greater relevance is given to birds and mammals, since these animals were the most sighted or, traditionally, are the ones that draw the most attention in the environments that surround them.

There is a predominance of mammals in both the biomes of Mato Grosso and Mato Grosso do Sul. Such animals perform important ecological functions as seed dispersers and, because some are predators, contribute to the population control of small animals, in the cycling and structuring of ecosystems. (Silva *et al.*, 2015).

The debates elected here are only the "tip of the *iceberg*" environmental, because when interviewing the family farmers who inhabit the settlements, the relationship that is established is sometimes complex. Some observe the presence of wild fauna as an indication of a biodiverse and balanced environment, therefore, in a positive way; others observe it with apprehension due to the loss of production in the swiddens through which they circulate. Thus, it can be considered that the model of use and occupation of natural environments directly influences the existing fauna, which suffers from the absence of food resources, especially larger animals, which, because they cannot survive in certain areas, migrate to others, and in this trajectory become vulnerable, and many end up being run over or exterminated by hunting.

The increase in agricultural and livestock production indicators and accelerated deforestation affect the food chain, forcing predators to seek new alternatives, preying on domestic animals. For some settlers, wild animals represent threats in contexts of economic fragility. Among these threats, the loss resulting from attacks by some species against small and large domestic animals, such as birds and cattle, stands out. Among them, venomous snakes are held responsible for the death of goats, sheep and cattle.

Another important issue refers to the fact that little importance was given to observations of small birds, many of which are at risk of extinction and could bring important information for an analysis of aspects about the integrity of these environments studied.

Revista ARACÊ
ISSN: 2358-2472

In view of this, it is necessary to make some considerations, seeking to understand the factors that must be considered when analyzing the relationship between nature and settlements. Medium to large animals, such as mammals, such as:

- ✓ The jaguars, ocelots, pumas, present in the Amazon, Caatinga, Cerrado, Atlantic Forest and Pantanal biomes, represent predators at the top of the food chain, that is, predators of animals that attack the swiddens of settlers such as capybaras, wild pigs, among others.
- ✓ The anteater, an animal that should be relatively common in the biomes studied, but which is actually cited as endangered, does not appear in the interviews. This is due both to the fact that its populations are already reduced and to its relatively elusive nature. Curiously, in the displacements of some technicians in the field, in mobilization activities, some of these animals could be seen, especially in the state of Mato Grosso, in the region that covers its north-central portion.
- ✓ The bird, whose popular name is jacu, was mentioned in all the mesoregions studied, despite this, it is the least sighted in the set of settlements researched. It should be borne in mind that more than one species is popularly known as jacu, which prefer forest environments. Thus, it is necessary to understand the results analyzed here, since all the settlements visited usually have permanent preservation areas, which are often associated with gallery forests or hillside forests, which are environments that can shelter these species. Thus, even if the citations are not in high numbers, it is understandable why they are cited in settlements of all the mesoregions studied.
- ✓ Small birds, such as woodpeckers, sanã and seedeaters threatened with extinction, were not mentioned by the surveyed settlers. Once again, an important aspect must be analyzed. The interviews, in the way they were conducted, that is, with a previous list of animals, end up inducing answers aimed at that group of animals listed. As can be seen in the list presented in the form, these birds are not presented and, obviously, were highlighted in the answers, or it was not even thought that "small birds" would represent "animal sightings". This issue has to be better thought out in future activities that seek the use of questionnaires for the "lay" population.
- ✓ Snakes are the most sighted reptiles in the settlements studied, and this seems easy to understand. First, because they are mentioned in the interviews and, second, because they are animals that are in fact common in the regions studied, they are of

Revista ARACÊ
ISSN: 2358-2472

wide distribution, appearing both in drier areas and in humid areas and, in addition, they are potential causes of problems because they attack farm animals, or because they are venomous, potential causes of accidents, which contributes to greater attention from rural residents. For these reasons, their sightings are recorded more effectively.

The state of Mato Grosso has a higher number of sightings of tapirs and capybaras than the state of Mato Grosso do Sul. Tapirs are large animals and are presented as answer options on the forms. Thus, whenever observed, they are remembered and mentioned in the interviews and, even though they are on the list of endangered species, they are relatively common in several of the environments studied. They are great seed dispersers and their presence is essential for the maintenance of the environments where they are present. But an important question refers to the fact that it is understood whether their presence in the settlements is a positive or negative indicator. Are they being watched because their environments are destroyed and they need to seek new sources of food in the cultures of the settlers or are they passing through, moving between fragments of reserves, just as a daily routine? A more detailed analysis of land use and occupation could shed some light on this question, but it is not the scope of this work in the way it is developed.

It is not the interest or objective of this study to exhaust the interpretations in view of the sighting of fauna and extinction of animals. However, unveiling this reality, seeking to deepen the procedures and techniques for new research, is fundamental for this study and subsequent deepening of the theme. Therefore, information that supports the explanation of the sighting or not of certain animals is sought in other areas of knowledge. For environmentalists, geographers and biologists, fauna sighting means maintaining balance in the biomes, as well as indicators that help to better understand the relationship between society and nature. In this context, the sighting is analyzed by several circumstances:

Types of sighting: sporadic or frequent;

Location of the sighting: where was the fauna sighting carried out? Near forest fragments, permanent preservation areas, in the fields, in backyards, crossing the side roads on trails or in pastures?

Conditions of the animal sighted: are the animals sighted large? Was the animal sighted looking for food and water, was it feeding, injured, looking for shelter, was it alone or

Revista ARACÊ
ISSN: 2358-2472

with its group? Also, was he running away from a predator, mating, playing, or was he with cubs?

Environmental conditions of the sighting: rainy or dry season, early morning, late afternoon, at night or early morning?

Instruments for viewing the animal: with the naked eye, with camera lenses or with binoculars?

Such circumstances require further research, and here they are presented as reflective possibilities that can help to compose scenarios about the sighting of fauna and its effects on rural settlements. It should be noted that these scenarios are reflections on this research context and that it is still in the process of research and deepening. Thus, the following scenarios are envisioned:

First scenario: the settlement is surrounded by areas of forest reserves or conservation units; they usually have watercourses, so the availability of food is greater, the number of individuals sighted tends to be greater and the economic impact of losses of crops and livestock is smaller.

Second scenario: the settlement is surrounded by large international *commodity* farms and has few forest fragments, so the sighting of fauna is scarce and consequently the losses in the gardens and livestock are not noticed.

Third scenario: the settlement is surrounded by large international *commodity* farms and has few forest fragments, so the sighting of fauna is scarce, but the losses in the swiddens and livestock are significant.

Fourth scenario: the settlement is surrounded by large international *commodity* farms and has few forest fragments, however there are ecological corridors, which reduces the sighting of fauna and, consequently, the losses in the swiddens and livestock are not noticed.

More research will be needed for further study and design of these scenarios, but, in advance, it is identified that educational processes with a bias in environmental education can contribute to the reduction of conflicts in the scenarios pointed out. Leff (2009, p. 18) encourages us to delve deeper into the issues of:

> Environmental education emerges and is based on a new knowledge that goes beyond the objective knowledge of the sciences. The rationality of modernity intends to put reality to the test, placing it outside the world that we perceive with the senses and a knowledge generated in the forge of the world of life. Environmental knowledge integrates rational knowledge and sensitive knowledge, the knowledge and flavors of life. Environmental knowledge proves reality with wise knowledge that

Revista ARACÊ
ISSN: 2358-2472

> is savored, in the sense of the Italian locution *asaggiare,* which puts reality to the test by tasting it, because it is tested to know what one thinks, and if the proof of life proves what one thinks, the one who tastes it becomes wise. In this way, the relationship between life and knowledge is restored (Leff, 2009, p. 18).

Furthermore, Leff (2009, p. 23) points out that:

> Environmental education thus recovers the original meaning of the notion of *educere,* as letting out the light; not as a new enlightenment of the thing, nor as the detachment from the object or the mimetic transmission of knowledge and knowledge, but rather as the pedagogical relationship that allows being to the being, which favors the powers of being, of ecological organization, of the forms of signification of nature and of the meanings of existence to be expressed and manifested. Environmental education is the dialogical process that fertilizes the real and opens the possibilities for becoming what one is not yet (Leff, 2009, p. 23).

Understanding that such circumstances and scenarios of fauna sighting can trigger actions of predation of wild animals and disruption of environmental balance is preponderant for the coexistence between humans and wild animals. It is a search between balance, economic production and environmental sustainability.

FINAL CONSIDERATIONS

One of the important elements for the maintenance of ecosystems is the maintenance of wild fauna, as it plays an important role both in the balance of food chains and in the conservation of native flora. However, fragmentation and anthropogenic pressures on forest remnants can result in the disappearance of native fauna, definitively influencing the biodiversity of a given environment.

The results presented here reveal that, although the area is uncharacterized with the predominance of pastures and crops, several animals still use these landscapes to establish their territory. In the surveyed settlements in the state of Mato Grosso, 122,197 animals were sighted, highlighting the areas belonging to the southern portion of the Amazon biome of Mato Grosso, with 51.39% of positive responses to sightings, mainly with sightings of mammals. In the rural settlements of Mato Grosso do Sul, the highest number of wildlife sightings was identified in the Cerrado biome, also with emphasis on mammals (41.73%).

The sighting of fauna makes it possible to identify the biodiversity present and, consequently, to promote Environmental Education actions, aiming at environmental preservation and conservation. It was identified that, in order to deepen the sighting, it would be relevant to take a portfolio with photographs of the species in the region to

Revista ARACÊ
ISSN: 2358-2472

facilitate identification and subsequent registration. However, this would also be an inducer of responses aimed at one or another group, which could be another negative factor. Thus, the use of interviews is always problematic in some aspects, even though it is a potentially strong mechanism for generating data without high expenses for studies of large areas, as is the case with the RADIS UFMT project.

However, the fact is that, for the maintenance of biodiversity, it is necessary to restore as many environments as possible, creating connections between the different forest fragments, through the creation of ecological corridors and providing Environmental Education processes to raise awareness of environmental issues.

Revista ARACÊ
ISSN: 2358-2472

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