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THE PERSPECTIVE OF PROFESSIONAL FISHERMEN AND LIVE BAIT COLLECTORS ABOUT CLIMATE CHANGE IN THE MIRANDA'S PANTANAL, MATO GROSSO DO SUL STATE (BRAZIL)

A PERSPECTIVA DE PESCADORES PROFISSIONAIS E COLETORES DE ISCAS-VIVAS SOBRE AS ALTERAÇÕES CLIMÁTICAS NO PANTANAL DE MIRANDA, MATO GROSSO DO SUL (BRASIL)

LA PERSPECTIVA DE PESCADORES PROFESIONALES Y RECOLECTORES DE CEBO VIVO SOBRE EL CAMBIO CLIMÁTICO EN EL PANTANAL DE MIRANDA, MATO GROSSO DO SUL (BRASIL)

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ABSTRACT

Climate change is already taking place in the Miranda sub-Pantanal and riverside groups historically residing there, such as professional fishermen and live bait collectors, are already feeling these changes, which have a negative and definitive impact on their ways of life and work, putting their immediate livelihoods at risk and, above all, the short future of their traditional crafts and their social-anthropological future linked essentially to the environment. In this article, you will be able to understand how, through applied scientific research, we reached this serious result.

Keywords: Upper Paraguay River Basin. Paraguay-Parana Wetland System. Work. Lifestyle.

RESUMO

As alterações climáticas já estão se dando no sub-Pantanal de Miranda e, grupos ribeirinhos historicamente residentes no local, como os pescadores profissionais e os 'isqueiros' já sentem estas mudanças, que implicam de modo negativo e definitivo nos seus modos de vida e trabalho, colocando em risco suas subsistências imediatas e, sobretudo, o futuro breve de seus ofícios tradicionais e seu devir social-antropológico vinculado essencialmente ao meio ambiente. Neste artigo, poderás compreender como, por meio da investigação científica aplicada, chegamos a este grave resultado.

Palavras-chave: Bacia do Alto Paraguai. Sistema Paraguai-Paraná de Áreas Úmidas. Trabalho. Modos de Vida.

RESUMEN

El cambio climático ya se está produciendo en el subpantanal de Miranda y los grupos ribereños que históricamente residen en este espacio, como los pescadores profesionales y recolectores de cebo vivo, ya están sintiendo estos cambios, que tienen un impacto negativo y definitivo en sus formas de vida y trabajo. Poniendo en riesgo sus medios de vida inmediatos y, sobre todo, el futuro a corto plazo de sus artesanías tradicionales y su futuro

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socio-antropológico vinculado esencialmente al medio ambiente. En este artículo podrás comprender cómo, a través de la investigación científica aplicada, llegamos a este importante resultado.

Palabras clave: Cuenca del Alto Paraguay. Sistema de Humedales Paraguay-Parana. Trabajo. Estilo de Vida.

1 INTRODUCTION

Global climate change is a natural phenomenon concerning planet Earth, its specific processes have been observed, cataloged and discussed since the nineteenth century. The search for understanding the facts, what are their implications about the dynamics, maintenance or extinction of natural populations and biomes around the biosphere, have been frequent in academic spheres throughout this time. Methods and techniques for measuring and interpreting environmental data have been implemented and improved through the application of scientific research in several different socio-environmental realities around the world (MENDONÇA, 2021).

In this sense, based on the synergy of knowledge already acquired and tested in theoretical and practical investigations on the subject, we can consider that global climate change already has a negative and direct impact on the ways in which human groups experience and reproduce their social, cultural, technological, economic, and political experiences (SILVA and GONÇALVES, 2022).

Therefore, it is pertinent to indicate that despite being a natural phenomenon, anthropogenic actions have accelerated this entire process (MORALES, et. all., 2020). By favoring extreme weather events that disrupt the natural dynamics of biomes and, to equal extent, endanger the possibility of life on Earth (AMBRIZZI, et. all., 2021; NOBRE, 2012).

Due to its breadth and potential impact on known forms of life, especially human life, the theme is one of the most important in science and politics today, demanding attention and appropriate actions by societies, companies and, above all, States (ARTAXO, 2020; FLEURY; MIGUEL and TADDEI, 2019).

The existential, philosophical, and moral paradox in this case is that this theme has been systematically neglected in these spheres, being considered secondary or of less immediate importance to societies, since it is a diffuse subject.

Bringing this debate closer to the objective geographical realities of South America and, in particular, of Brazil, it is possible to indicate that since the beginning of the 2000s, important studies have already pointed to significant changes in regional climate models and cycles, focusing on the construction of current climate scenarios - with a significant increase in surface temperatures and a reduction in average precipitation and annual rainfall distribution over the Brazilian territory. for instance. These changes imply impacts on natural ecosystems and on the distribution and maintenance of biomes, which, in turn, bring with

them shocks in biodiversity and, a posteriori, in the anthropic uses and occupations of these geographical spaces (NOBRE, et. all., 2007).

Specifically regarding the Pantanal biome, it is essential to point out that this is an extensive periodic floodplain, an organic result of constant flood and drought cycles over geological time. In this landscape, the vegetation follows the dynamics of the waters and the fauna, in turn, naturally harmonizes with the course of the flora. In this sense, the connections between animals, plants and men are profoundly conditioned by the seasonality of this water regime (FARIA and NICOLA, 2008; BEDÁ, 2006).

This is a transboundary biome that is inserted in the Upper Paraguay Basin (BAP), constituting a sedimentary plain with approximately 195,000 square kilometers, which occupies areas and territories in the states of Mato Grosso and Mato Grosso do Sul (in Brazil) and, in addition, in Bolivia and Paraguay (MORETTI and GONÇALVES, 2020).

It should be noted that the BAP is a hydrological unit composed of three integrated and synergistic compartments: Plateaus, Depressions and the Pantanal. The first two are terrestrial ecosystems, while the last is a large wetland area, with unique natural property, multifunctional, complex, ecologically sensitive, and which provides significant environmental services to the population, such as: food and water provision, regulation of floods and droughts, among many others (IRIGARAY; CUNHA and JUNK, 2020).

Specifically about the Pantanal, it is possible to infer that it is a unique landscape in the world, since it is fragmented and can be perceived as being "several contrastive wetlands", according to the specificities of the geomorphology, biogeography, climate and phytophysiognomic aspect expressed in particular in each micro-region observed and analyzed, being: 11 in total, only in Brazil (SILVA and ABDON, 1998; AB'SÁBER, 2006). According to EMBRAPA Pantanal (2023), they are: 1) Cáceres; 2) Poconé; 3) Baron of Melgaço; 4) Paraguay; 5) Paiaguás; 6) Nhecolândia; 7) Abobral; 8) Aquidauana; 9) Miranda; 10) Nabileque; 11) Porto Murtinho.

The biological diversity of the Pantanal includes more than 650 different species of birds, 263 species of freshwater fish, 124 species of mammals, 60 species of amphibians and 80 species of reptiles. In addition, it has 4,700 species of plants (SOS PANTANAL, 2023). This

biodiversity and geographical specificity gives the biome the *status* of Biosphere Reserve, National Heritage and Wetland of International Importance (Ramsar) (UNESCO/UN and BRAZIL, 2016).

Regarding its climate, it is possible to infer that this is an objective result of the geographic interactions resulting from the contact areas of the BAP, the Paraná Hydrographic Basin and the Serra da Bodoquena, in addition to the specificities of its own depressions and characteristic plains. In general, the climate of the Pantanal is considered to be the typical tropical. In this one, the winter is dry and the summer is rainy. The average annual temperature in the plain is 25°C and the average humidity is 82%. However, it is worth noting that there are important variations in the distribution and intensity of climatic factors among the sub-regions of the Pantanal (PEREIRA; CHÁVEZ and SILVA, 2012).

Further, it is relevant to point out that the Pantanal has a history of ancestral human occupation

and, by the Iberian conquerors, since the sixteenth century (FRANCO, et. al., 2013; MARTINHO, 2022). However, in recent decades, it has been suffering even more intense anthropogenic pressures, through economic activities and urbanization implemented within the BAP. Such as the deforestation of new areas for agriculture or even for the formation of exotic pasture for agriculture, the implementation of fishing spots, inns and farm hotels that, among other factors, have increased the areas of human occupation and mobilized an unprecedented influx of people to the region. As a result of this scenario, typical natural areas are increasingly reduced or suppressed (BEDÁ, 2006; BRAZIL, 2020).

In this sense, it is possible to infer that human activities in the Pantanal imply negative and permanent impacts on the biome (ALHO, et. al, 2019; Thomas, et. al., 2009). Since, in view of the bibliographic references consulted and the scenario expressed in the aforementioned argumentative chain, we already infer that the Pantanal biome is at risk of collapse due to regional climate change and contemporary global warming, and the investments of capital on this space enhance this process (BERGIER and ASSINE, 2022).

Consequently, the social subjects and the object of study of this scientific research are those individuals who have their subsistence and way of life, directly linked to nature. In this case: the professional fishermen and the "lighters", who live and work in the sub-Pantanal of Miranda, in the municipality of Miranda, in Mato Grosso do Sul (Figure 01).

These subjects were chosen in an intentional random way, due to their social, anthropological characteristics and, above all, existential connections with the Pantanal biome , since they are extremely vulnerable groups to climate change, since it has a direct impact on their way of life and daily symbolic reproduction. Therefore, they are fragile communities

due to their historical socioeconomic conditions (BARNABÉ; SILVA and GONÇALVES, 2007) and who are/will be increasingly affected by climate change and global warming (SPACKI, et. all., 2015).

Properly understanding their perceptions about these phenomena builds an important reference for the formulation of public policies and measures to adapt to the climatic conditions to which these actors are/will be exposed over time.

Thus, the central objective of this research and, consequently, of this *paper* is to establish a case study about the social perceptions of professional fishermen (Colony of Professional Fishermen of Miranda Z-5) and of the "lighters" (Association of Artisanal Fishermen of Miranda Baits: APAIM), who work in the sub-Pantanal of Miranda, in Miranda (MS) (Figure 01), about climate change and, how these already impact their ways of life, especially in their labor and economic development.

The next topic of this article describes the methodological procedures and techniques used in the application of this research, in the collection and interpretation of the data obtained.

2 METHODOLOGICAL PROCEDURES

This is an applied research, of qualitative character and its development took place through the conscious, technical and synergistic use of various scientific procedures, which promoted the appropriate support for the investigation and interpretation of the object of study and the associated phenomenon.

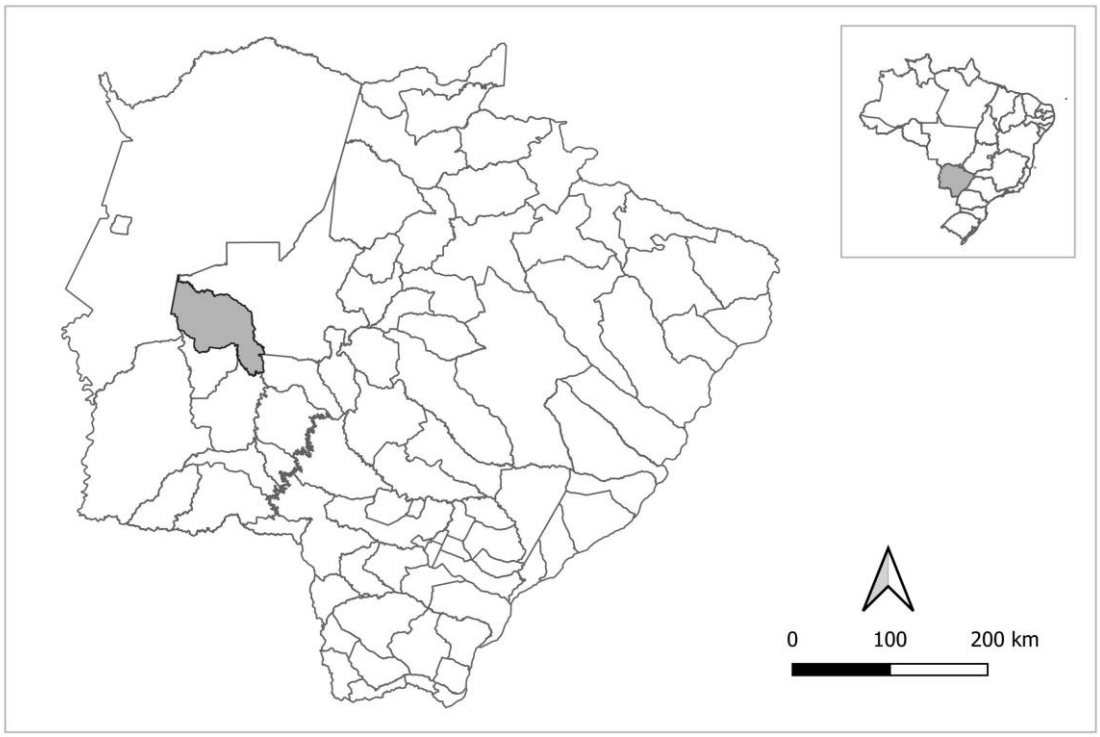
Preliminarily, secondary data were obtained through bibliographic exploration (MARCONI and LAKATOS, 2021). At this stage of the research, the essential keywords were: climate change; global warming; Swamp. These terms were consulted in repositories of recognized universities and databases, such as: CAPES Journals, *Google Academic* and *Scopus*. The survey prioritized the examination of works published in the last 05 years (2019-2023), in order to establish an updated scenario on the topics involved in the research. In this process we analyzed: books, scientific articles (national and international), doctoral theses, master's dissertations, as well as technical texts from international organizations, government agencies, research centers and non-governmental organizations (NGOs), which dealt with the themes of our scrutiny.

Next, with regard to the collection of primary data, the locus calculation took place between September 25 and 29, 2023, in Miranda (sub-Pantanal de Miranda), in Mato Grosso

do Sul (Figure 01). These actions have the fundamental characteristic of geographic research, being an empirical and descriptive observation. In this sense, in order to properly perform this technical procedure, the researcher adopted the behavior of an external observer, capturing and recording the information coming from the "object under analysis", which is a neutral agent, only systematizing what the perception of the phenomena is revealed to him by the social subjects, holders of knowledge about the phenomenon examined (SUERTEGARAY, 2002).

Figure 1

Location of the Municipality of Miranda, Mato Grosso do Sul, Brazil



Source: GISMAPS: Geoprocessing, (2023).

In these actions, dynamic questionnaires were applied (ADOLFO, 2021), structured as open and closed questions, and also the application of the *Likert scale* (CUNHA, 2007), the combination of these questions, sought to generate primary data so that we can understand the profile of the social subjects interviewed and their environmental perception (AP) about climate change in this municipality and, also, what are the objective implications in their daily lives and ways of life - objective and symbolic.

It should be noted that we focused on addressing 05 (five) essential aspects in this survey, about the sub-Pantanal of Miranda: I) general perception of the climate; II) general

perception of the territory; III) general perception of rivers; IV) general perception of deforestation and, V) in a direct and open way: "Is the climate changing? How does it affect you?".

Regarding the theme of environmental perception, it is pertinent to argue that this perspective unifies psychological, geographical, biological and anthropological understandings, aiming at a better understanding of the factors, mechanisms and processes that motivate the social subject to have perceptions and behaviors in relation to their environment. In philosophical terms, it is about experience as a transcendental experience. But, in our specific case, environmental perception can be defined as the awareness of the environment by Man (SANTOS and SOUZA, 2015).

The sampling of this research was based on the conceptual perspective called: "snowball". This is a form of non-probabilistic sample, which uses reference chains or traditional social networks (VINUTO, 2014).

The execution of this technique was built as follows: 1) we used key informants: the presidents of the Association of Artisanal Fishermen of Miranda Baits (APAIM) and of the Colony of Professional Fishermen of Miranda (Z-5), called in this case "seeds"; 2) in turn, based on their personal/institutional networks, they indicated and facilitated new contacts with subjects invested with the desired characteristics, in this episode: the members/associates of APAIM and/or the Z-5 Colony; 3) in this way, it occurred, successively, until the saturation of the investigation. Which, in this event, occurred for two reasons: a) systemic repetition in the discourses of the answers and, b) unanimity in the results of the scales.

Later, the registration and documentation of these actions were carried out through the application of questionnaires (printed), in addition to the preparation of a collection of digital photos and videos, made by a smartphone cell phone device (SAMSUNG M53).

The process of analyzing the data collected and described throughout the research and, likewise, its results, follow the inductive method (MARCONI and LAKATOS, 2021).

3 RESULTS AND DISCUSSIONS

In this topic are concentrated the objective elements of our field research, achieved from the application of the procedures, methods and techniques already described and, in function of the objective proposed in this work.

Regarding the organization of the information, we will follow the *layout* of the questionnaire. Thus, it is worth noting that in the period of this field research, a total of 31

people were interviewed, of which 02 (two) were the "seeds" and the others, 29 (twenty-nine), members and/or associates. Of this sample, only 03 (three) are female and 28 (twenty-eight) are male. Of these, 23 (twenty-three) are between 20 and 59 years old and 10 (ten) are over 60 (sixty) years old. No subject up to 19 (nineteen) years old. The entire sample indicated that they have lived for at least 20 (twenty) years in the Pantanal of Miranda, if not their entire lives. 25 (twenty-five) people declared having studied up to elementary school/primary, 06 (six) were in elementary school II/gymnasium.

In connection with the labor issue, 10 (ten) declared themselves as "lighters", 10 (ten) declared themselves as professional fishermen and 11 (eleven) declared themselves as "lighters" and also fishermen. Of these, the average time in the exercise of the profession is 25 (twenty-five) years, carried out, for the most part, within the Pantanal biome and, specifically, in the sub-Pantanal of Miranda.

The entire sample receives some type of benefit from the federal government, whether pensions, family allowance or unemployment insurance - due to the period of prohibition of fishing, due to the spawning of fish.

Having established the sample profile, it should be noted that the questionnaire was configured with the questions in distinct thematic blocks, but synergistic with each other.

Thus, in the first set of questions about the specific perception of this sample about the climate in the sub-Pantanal of Miranda, we can indicate that:

I. The heat, windstorms, smoke and dust in the air, are much stronger/more intense nowadays and;
II. The cold and rains were more intense more than 30 (thirty) years ago.

Regarding regional climate change and its specific impacts, the Pantanal is the biome that is expected to have the highest annual average temperature increase, when compared to the other typical ecosystems of Brazil. According to Marengo *et. all*., (2007), by the year 2100, there should be an increase of at least 3.4°C, and may reach up to 4.6°C, more in the region.

In the specific case of the territory of the sub-Pantanal of Miranda, we can indicate that:

I. The fires are stronger/more intense today, even with the respect of farmers, fishermen, lighters and tourists, too, being considered stronger/more intense today;
II. The presence of tourists, in turn, has been perceived as being more intense for more than 30 (thirty) years.

Another negative phenomenon has been the occurrence of forest fires, which are increasingly
constant and with a more alarming magnitude in the biome (FIOCRUZ, 2020; FARKAS, 2020; MATOS, 2015).

With specific reference to the condition of the rivers that make up the sub-Pantanal of Miranda, we can indicate that:

I. Siltation is stronger/more intense today;
II. The cleanliness, volume, regularity of floods, the presence of fish and the ease of catching them and/or collecting live bait has been perceived as being more intense for more than 30 (thirty) years;

With a report on deforestation in the sub-Pantanal of Miranda: unanimity in the sample's responses, indicating that, currently, the existence of this fact is perceived more than in the past.

Thus, it must be considered that climate change is already underway in the biome contemporaneously (LÁZARO, et. all., 2020; HUDSON, et. all., 2020). They can be observed in a pragmatic way from the following processes: 1) altered hydrological cycles ; 2) increase in heat, change in rainfall and increase in fires; 3) uprooting of the banks and silting of water bodies; 4) changes in the fishing stock ; 5) increase in the phenomenon of decoada in the plain (SPACKI, et. all., 2015).

Further, regarding the open question of the questionnaire, in which you were asked if the climate is changing in the sub-Pantanal of Miranda and how does this affect you? We will highlight two important and didactic passages on the subject, given by the presidents of APAIM and Colônia Z-5, respectively, throughout the interviews:

> (...) This business of changing climate, for us, has been going on for a while. Certainly, the Pantanal is not the same as when we started here! Much hotter, we slept with a blanket! Now, no way (...) you can't live on bait and fish anymore. There are Pantanal people who had never seen bricks or cement, but they left the riverbank, we have to live, pay the bills and raise the boys, we can't do it anymore (...), everything has changed this climate business!

> (...) Drought and flood has always been here, but, we knew, right?! (...), before. Now, when there are fish, there are no fishermen and, when there are fishermen, there are no fish! It doesn't pay to be a fisherman anymore, we continue, because we were born and raised in the rivers here, we don't know how to do anything else and we like it a lot (...), but with all these changes, young people don't want to know about it anymore!

> It takes a lot of work and it doesn't make a profit! In fact, they are not even paying the expenses (...) before, we went out in groups and stayed for a week in the Pantanal, came down and fished. Now, you need to stay 15 to 20 days away, to take the same amount, it's not worth it. It's a lot of fuel, food, ice (...), it's better to stay here, because in the Pantanal, things are not easy (...).

If, perhaps, there was any doubt regarding the effective perception of climate change in the sub-Pantanal of Miranda, on the part of the investigated group, due to the questions and the technical scale used in the research, when we were faced with the spontaneous arguments of these important social actors on the subject, indicating the inherent difficulties and, above all, the impacts already perceived in their lives, Mainly, in the objective issue of work and (economic) income, we consider this uncertainty to be resolved and, therefore, we consider that the objective proposed in this study was fully achieved.

In the next point of this article, the final considerations, assisted and supported by the indications related to a) synthesis of facts and objectives; b) implications of this research; c) suggestions for new research cycles and, d) conclusion.

4 FINAL CONSIDERATIONS

The exordial argument of this paragraph must be the veracity of the facts found during this investigation, from the secondary data, to those established *in locus*. In both cases, these were collected and examined based on technical and scientific criteria, as a result of an exercise of methodological application that had already been previously validated by scientific peers.

Further, it is also pertinent to highlight that the centrality of the objective proposed in the preliminary research project and, consequently, of this *paper* were adequately conquered and undertaken, in time, space and with the predetermined material and immaterial resources.

Therefore, in a synthetic way (a), we can state that: "climate change is already taking place in the sub-Pantanal of Miranda and, riverside groups historically resident in the place, such as professional fishermen and 'lighters' already feel these changes, which imply in a negative and definitive way their ways of life and work, putting at risk their immediate subsistences and, above all, the brief future of their traditional crafts and their social-anthropological becoming essentially linked to the environment".

In this sense, we understand that the direct academic implication (b) is that the arguments and, especially, the results achieved in this investigation form a validation scenario, in relation to the past studies used as theoretical and methodological foundations of this research enterprise, since they are in objective consonance. In this way, the data and considerations generated from this research can and should be used as current references in the construction of public policies and, in particular, actions to mitigate and adapt to climate change in the sub-Pantanal of Miranda and, consequently, to the focus groups studied.

On the occasion of the success of the objectives and methods used in this study, we infer that the new research cycles (c) should, as a priority, cover the other sub-regions of the Pantanal biome, in Mato Grosso do Sul and Mato Grosso, in Brazil, in addition to the cross-border spaces, which are shared with Bolivia and Paraguay, in order to (or, no), to build an overview of the social perceptions of traditional groups about climate change in the Pantanal as a whole.

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- Ecoa: Ecologia e Ação;
- GISMAPS: Geoprocessamento.

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