

PANTANAL

Vol. 06 / nº 01 / 2021 / ISSN 2357 - 9056



FINANCED BY
THE EUROPEAN
UNION

SCIENCE MAGAZINE



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AND PROVIDE HOPE FOR
RESILIENCE** PG 36



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PLANTS
SUSTAIN
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HORSE IS
HEARTY,
TOUGH AND
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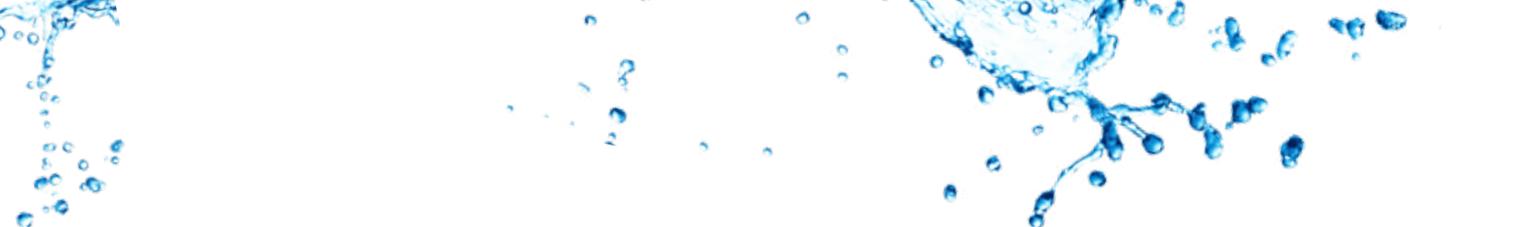
SOLIDARITY AND COMMITMENT

The Pantanal asked for water. The land of the rivers, lakes, oxbows, soda lakes and annual flood cycles slowly dried up over two consecutive years of drought. Combustible organic matter built up in the dry pastures, forest patches, dried out lakes and in floodplains that were usually inundated. Unfortunate careless behavior by some inhabitants started the fires that rapidly raged across the Pantanal. Innumerable wild animals were killed or injured. Predation and scavenging became common. Many survivors still faced hunger and thirst, competing with each other for food that was not scorched by fires, and for remaining water found in the larger lakes.

It is true that the Pantanal biome evolved with the presence of fires. Many ecological processes are triggered by fire, such as the flowering and fruiting of certain trees, including the famous paratudos (trumpet trees, genus *Tabebuia*), or the germination of *carandá* palm seeds (*Copernicia alba*) that are dormant in the soil un-

til fire arrives. There are many plant species that developed protections against flames. For example, some have thick bark or roots capable of sprouting through the ashes. Among the animals, many species are able to escape or seek refuge in underground burrows, natural tree cavities or aquatic habitats.

These strategies generally work during periodic fires of moderate intensity, whether natural, started by lightning or human-caused. However, this was not the case in 2019 and 2020. Although the prolonged drought was within the range of climatic extremes recorded in the Pantanal, measures to control the accumulation of highly-combustible vegetation were lacking, environmental awareness and commonsense by people using fire were lacking, adequate training for firefighting was lacking and emergency responses from government authorities were slow and inadequate. As a result, small fires grew in intensity and size, multiplied, and soon rav-



aged and spread across the landscape. Firefighters, few in number, struggled to reach inaccessible fire stricken areas that did not have roads, electricity or an adequate communication system.

Researchers, volunteers, community members, local governments and non-governmental organizations have come together to put out the flames and try to minimize biodiversity losses. WWF-Brazil supported numerous initiatives to organize fire brigades on ranches and in Pantanal communities, providing firefighting gear and personal protective equipment to firefighters. They provided funds for setting up emergency rescue centers to treat injured animals in the field, and they donated medication and veterinarian supplies to rescue and rehabilitation centers (e.g., CRAS in Campo Grande, Mato Grosso do Sul). WWF-Paraguay and WWF-Bolivia set up an international communication network to exchange information about wildfire movements along the borders of the three countries.

This edition of the magazine presents one of the first assessments of fire impacts and the long-term consequences that will affect the Pantanal over the coming years. There is also an encouraging report of resilience, as in the case

of hyacinth macaws, whose nests were impacted by fire during the peak of their reproductive season at Caiman Ecological Refuge and at Fazenda São Francisco do Perigara in 2019 and 2020, respectively. WWF-Brazil provided emergency aid to implement nest protection measures for the new generation of surviving hyacinth macaws.

In this edition of *Pantanal Science*, the ecological functions of pollinators and their intricate networks of plant-pollinator interactions are presented. Although they are small, even insects can play an important role in the restoration of the Pantanal. Another article discusses parasitism, emphasizing the importance of considering the health of both domestic animals and wildlife as one. The role of herbivorous mammals - true environmental guardians, capable of providing conservation tips for dealing with ongoing land-use changes - is also described. This edition also reports on the predator-prey relationships of ocelots, one of the most abundant feline species in the Pantanal.

With a desire to get back to normal - in the face of wildfires and the COVID-19 pandemic - it is important to provide examples of sustainable businesses being developed in the region and present a 20-year

commemoration of the Fishes of Bonito Project, connecting science, communities and tourism. More than ever, this is a time to value traditional customs and knowledge - such as the use of *Pantaneiro* horses for handling cattle, and the use of edible native plants that enrich *Pantaneiro* diets - among other ongoing initiatives. In this edition, ecological economic zoning instruments for participative territorial planning and landscape change scenario projections are not forgotten. Territorial planning reconciles economic growth and protection of natural resources, favoring current and future generations, while landscape scenario projections allow us to plan a future that incorporates the wishes of all *Pantaneiros*.

Through the array of subjects covered in this edition, WWF-Brazil reiterates its commitment to conservation of the vast biodiversity in the Pantanal and the surrounding highlands. And their belief in solidarity without borders. Together we can face the challenges and prioritize environmental actions that guarantee the resilience of the Pantanal ecosystem!

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Spanish - Easy Translation Services and Flash Translations
English - Alexine Keuroghlian and Donald P. Eaton

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DIGITAL MAGAZINE: ACCESS THE QR CODE

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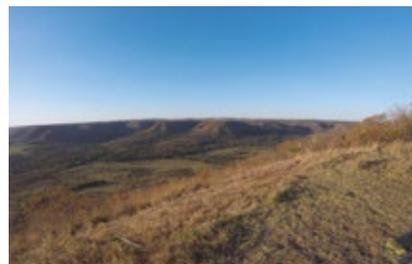
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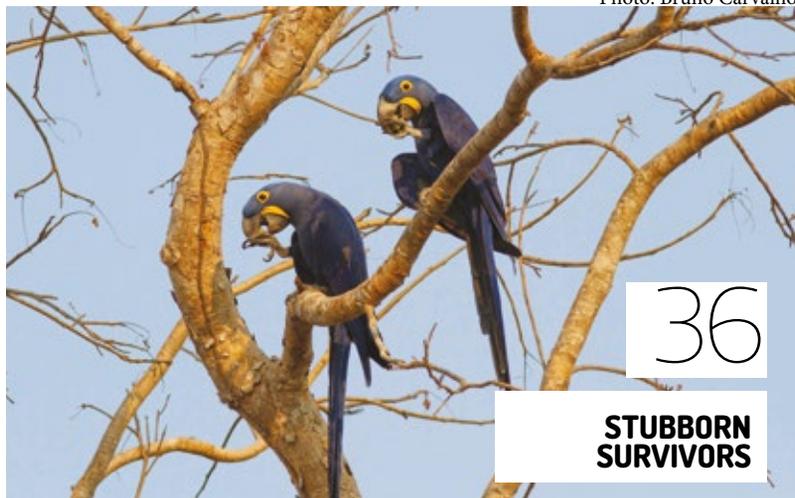


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We appreciate and thank the information from the field on the impacts of fires in the Pantanal provided by researchers, collaborators and volunteers and used in the articles on the fire impacts (Pg 30) and on the blue macaws resilience (Pg 36):

Andrea Garay - Geographic Information Systems Coordinator (SIG) WWF-Paraguay, Karim Musalem - Conservation Coordinator WWF-Paraguay, Maria Eduarda Coelho - Conservation Technician WWF-Brasil, Patrícia Medici, National Initiative for the Brazilian Tapir Conservation and the Ecological Research Institute Coordinator - INCAB/IPÊ, Thaishi Leonardo da Silva - Conservation Analyst WWF Brasil, Victor Hugo Magallanes - WWF-Bolivia and Walfrido Moraes Tomas - Embrapa Pantanal

We also thank the following NGOs, companies, farms, inns, research institutions, and wildlife refuges, for their support in fighting fire fronts, rescuing wild animals, supplying food and water to survivors, and facilitating the field trip of the aforementioned researchers:

Bioparc, Campanha Adote um Ninho 2020, CRAS-MS, Documenta Pantanal, Fazenda São Francisco de Perigara, Flocruz, Fundação OS, Fundação Toyota do Brasil, Galo da Manhã, Granado, Hotel Fazenda Baía das Pedras, Instituto Solar dos Abacaxis, Jogabilidade, Luan Santana, Neenergia, O Boticário, *Parrots International*, Refúgio Ecológico Caiman, RPPN SESC Pantanal, Sema-MT, Sicredi, SOS Pantanal, Universidade Anhanguera-UNIDERP, Universidade Federal do Rio Grande do Sul (UFRGS), *Whitley Fund for Nature*, *Wildlife Studios*, WWF-Brasil, Zoo de Zurich WCS.

STUBBORN SURVIVORS

With their nests threatened by fire, hyacinth macaws resist and do not abandon their chicks. Now they need your help!

BY NEIVA MARIA ROBALDO GUEDES, PEDRO SCHERER-NETO, FERNANDA MUSSI FONTOURA, LUCIANA PINHEIRO FERREIRA, KEFANY RAMALHO, ANA CECÍLIA DE PAULA LOURENÇO, BRUNO HENRIQUE GROLLI CARVALHO, MARCOS ROBERTO FERRAMOSCA AND THAMY DE ALMEIDA MOREIRA



During very dry years, when fires dominate the landscape and spread across the Pantanal floodplain, some wildlife are able to escape or find safe refuge. In most cases, fires reach high into the trees and spread quickly, and temperatures be-

come excessively hot. Under these conditions, only those animals that can run, jump, crawl or fly fast enough in the right direction are able to escape.

This is what happened with many hyacinth macaws (*Anodorhynchus hyacinthinus*) in 2019 and 2020 when the Pantanal experienced severe drought and uncontrolled wildfires two years in a row. Since 1994, hyacinth macaw nests have been monitored by the Hyacinth Macaw Institute (HMI) at Caiman Ecological

nus) in 2019 and 2020 when the Pantanal experienced severe drought and uncontrolled wildfires two years in a row. Since 1994, hyacinth macaw nests have been monitored by the Hyacinth Macaw Institute (HMI) at Caiman Ecological

Refuge (REC) in the Miranda River region of Mato Grosso do Sul state, Brazil. In September of 2019, a fire started on a neighboring ranch of the REC and spread quickly across the Aquidauna River, and throughout the region. A combination of factors was responsible for this fire: wind and low relative humidity, high temperatures and the accumulation of dry organic material. Unfortunately, the

(or artificial nest) for years. Palm fruits found near the nests are used to feed their young. Use of numerous macaw tree



Photos: Bruno Carvalho

flames reached the REC, one of the largest hyacinth macaw reproduction sites in the Pantanal.

At the REC, there are 98 registered nests, 51 of which are natural and 47 artificial. Similar to other macaws, they form monogamous pairs, and repeatedly use the same tree cavity

cavities is disput-

ed by other birds, so the cavities make up an important component of biodiversity.

Hyacinth macaws are large birds and fast fliers, but when the fires arrived, they were in the peak of their reproductive period with eggs or newborn chicks. Frequently used nesting sites and an entire generation of hyacinth macaws was threatened.

The fire spread quickly and for 16 days all the ranch employees, hotel staff and researchers were fighting the out-of-control nightmare of a fire. After more than two weeks, the rains finally arrived and extinguished the flames.

About 60% of the REC burned with varying levels of fire intensity impacting different areas. For example, in some areas, all the vegetation was charred, and in others, only the grasses and undergrowth vegetation were burned. Extensive areas of acuri (*Attalea phalerata*) and bocaiúva

(*Acrocomia aculeata*), important palm resources, were also destroyed. Both species occur in homogeneous formations, and serve as a “pantry” for hyacinth macaws, which have one of the most specialized diets of birds in the Pantanal.

Almost half (49%) of the active hyacinth macaw nests suffered some kind of impact. In some cases, the fire reached the nest site and both eggs and chicks were killed (this is called “direct failure”). Another type of impact, “indirect failure”, occurred when the fire did not burn the tree, but offspring mortality was caused by heat and/or smoke. In some cases, the fire reached the nest, killing some chicks, but one survived (“direct interference”). In other cases the fire did not reach the nesting tree area, but there was surrounding environmental damage that reduced offspring survival (“indirect interference”).

For some hyacinth macaw nests, tree trunks were lined with sheets of metallic straps to reduce the predation of eggs and chicks by other wildlife. When the fire spread across the landscape, these straps not only helped to protect the nests from the flames, but also protected the hyacinth offspring by deterring predators from climbing the trees.

Monitoring of fire impacts on the macaws began shortly after the fire and continued until the end of their reproduction cycle in 2019. In addition to monitoring nests, other factors related to burned vegetation and the survival of offspring were evaluated. For example, the loss of ripe palm resources, such as acuri and bocaiúva; the decrease in fruit production and the loss of monodominant palm formations, such as *acurizais* and *bocaiuvais*; and the increased rate of predation on adults and offspring. Monitoring data on fire impacts will be necessary for several years in order to determine the effects on plant and animal communities; this will include monitoring of hyacinth macaw disputes with insects and other birds that have also lost nesting sites and will try to occupy suitable nest cavities.

The hyacinth macaw repro-

duction center at REC is considered a natural laboratory for gaining knowledge about the complex relationships between the macaws and their environment. Ultimately, the effects of fire-related losses on current and future generations still need to be observed, especially if the offspring do not join the reproductive population within 9 or 10 years. All of these observations will contribute to discussions on fire prevention and remediation measures, focusing on reducing negative impacts during and after the fires.

In fact, some lessons learned in 2019 were applied to protecting hyacinth macaws during the 2020 breeding season when the Pantanal floodplain burned again. The fires were caused by a prolonged drought combined with strong winds and high temperatures, the accumulation of highly-combustible decomposing vegetation and weak enforcement measures for controlling unauthorized burning. In 2020, temperatures were higher and fires were more numerous, widespread and difficult to control. New areas were burned in 2020 such as the São Francisco do Perigara ranch in Mato Grosso state, an important refuge with the highest concentration of hyacinth macaws in the Pantanal.



Metal straps and weeding protect nests (top and next page right). Acuri coconuts matured a year later (next page, left)

The Hyacinth Macaw Institute has been monitoring hyacinth macaw nests on the ranch since 2000 when the first population survey was conducted. In 2005, the team initiated an evaluation of the hyacinth macaw's reproductive success by registering and mapping the nest sites. On July 30, 2020, data indicated that when a fire reached the neighboring Perigara Indigenous Territory, home to the Boe people (formerly called Bororo), it was raging and fierce. Help to put out the fire came from



Photo: Neiva Guedes



Photo: Bruno Carvalho

neighboring farms, volunteers, and firefighters from the SESC Pantanal private reserve.

However, fires are difficult to control in a region with difficult access, without roads, with little water during the dry season and sparse infrastructure. Consequently, it didn't take long for the fire to reach the São Francisco do Perigara ranch, and by August 1st, small Cerrado forest patches started to burn. Unfortunately, the fire quickly spread throughout the property and burned for 21 days, caus-

ing varying levels of damage to 92% of the ranch. Only the area around the ranch home, where the macaws roosted and some other patches of vegetation escaped the fire.

The researchers were only able to assess the impacts on the hyacinth macaw population a month after the fire. Many carcasses had already decayed or been consumed by scavengers, so could not be counted. Even so, thousands of mammals, reptiles, amphibians and insects were lost along with important habitat

and food sources burned in the fire. It is very difficult to obtain accurate numbers on animals and species impacted by the fire, but the loss was enormous.

In addition to the plants and animals, numerous ecological and functional relationships were destroyed or damaged. Tree cavities, nectar production, the abundance of fruits and many other resources - essential as dens and nesting sites or food resources - will take years or decades to recover.

About 35% of hyacinth

macaw nests at the Perigara ranch were affected by the fire. Fortunately, all of the active nests were in areas with moderate-intensity fires, often burning at the base of the tree, but without flames reaching the nesting cavity. Based on the age of fledglings, researchers concluded that they were born after the fire. Some nests were preserved thanks to the clear-

continued to remain on the ranch. A total of 736 adult hyacinths were registered after the fire, a number close to the 750 observed in August 2019. However, they stopped using their usual roosting site close to the ranch home, where they have been gathering for over 60 years. Small groups of macaws were found, scattered near small, drying ponds. A large

digestive system.

Based on lessons learned about post-fire management, it was essential to immediately supplement reduced fruit availability with *acuri* and *bocaiúva* nuts provided at feeding station platforms. Additional water sources were also necessary, and by December 2020, two wells and twelve water troughs / dugouts were built



ing of the vegetation (firebreak) around the trees in January 2020. This management strategy reduces the amount of fuel for the fire and the height of the flames.

Although many of the hyacinth macaw palm resources from *acurizais* and *bocaiúvas* were destroyed, the adults

group remained around a lake with abundant water and piles of *acuri* and *bocaiúva* nuts regurgitated by cattle. The macaws traditionally follow the cattle in the pasture and pick through the cattle regurgitations for palm nuts, because it is easier to crack open the nuts once they pass through a cows'

for the hyacinth macaws. The trunks of all of the trees with active nests were lined with sheets of metallic straps. Artificial nests were replaced or reinstalled to replace damaged ones, and additional nests were placed throughout the region to compensate for the loss of fire damaged natural cavities.

Natural nests in trees need maintenance to increase the longevity of the tree cavity. This includes clearing combustible vegetation at the bases of the trees. Installing camera traps post-fire helps monitor the general behavior and movements of birds and wildlife. Monitoring the natural recovery of key plants such as *acuri*, *bocaiúva* and *manduvi* (*Ster-*



Photo: Bruno Carvalho

culia apetala), the latter which the hyacinth relies on almost exclusively for nesting, is also important. If the data indicates low post-fire regeneration of these key species, then planting of seedlings and seeds will be initiated to help restore these important resources.

Remarkably, parental care

behavior was observed with camera traps during the fires. Videos of hyacinth macaws recorded how parents did not abandon their chicks or eggs, even when the fire was close. And now, like all the other fire survivors, they must overcome three main challenges: finding food and nest sites (protected from rain or direct sunlight), and they need to be in good condi-

At Perigara, surviving macaws follow the cattle to eat regurgitated acuris

tion in order to defend themselves against predators.

In the wake of the wildfires that advanced across large portions of the Pantanal, the demand for healthy habitats, nest sites, and food resources is much greater than what the environment is able to supply for wildlife. This may cause displacement and dispersal of individuals or species. For this reason, new projects - including management of the second macaw chick - should be discussed and developed in partnership with technicians and analysts from the Chico Mendes Institute for Biodiversity Conservation (ICMBio). Clarifying: although the hyacinth macaw lays two or sometimes 3 eggs

per clutch, the pair is unable to feed all the fledglings. Only the strongest chick of each clutch survives to the age of flight and leaves the nest. Management of the second chick involves rescuing the weakest chick(s) from the nest and raising it for future reintroduction into the wild; artificially increasing the survival rate of the new generation.

Many lessons emerged from these two fire-impacted years. Nature will recover. Signs of recovery are seen a year and a half (January 2021) after the fire at REC. The rains have renewed the landscape. *Acurizais* produced ripe and green fruit bunches from *acuri* palms still black from the flames. Like the *acuris*, other Cerrado plant species have fire resistant traits and show resilience. However, large areas have been burned, many ecological functions have not been reestablished and due to the long recovery times, there will be food shortages for many animals, some of which are vulnerable species.

This is the case for the hyacinth macaw. Despite its size and demonstrated resistance, the species needs special attention and an Emergency Recovery Plan to minimize fire impacts over the short, medium and long-term. The support of society will be essential during this process.

More than 30% of the Pantanal has been destroyed.

Make a donation and help WWF-Brazil in the work of recovering nature and people affected by the fires.

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