

Where the few jaguars still alive are hiding

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The survival of the jaguar (*Panthera onca*) is critically endangered in Brazil. Scientists have recently found signs that there are only about 300 of these top predators left in the biome—a tiny number. There are many reasons for the virtual disappearance of the largest feline in the Americas.

The first and most obvious reason is that only 7% of the Atlantic Rainforest remains. Originally the biome extended practically all the way along the coast from the Northeast to the South of Brazil, and on to northern Argentina and parts of Paraguay and Uruguay. Worse still, the tiny remnant is highly fragmented, so that to survive in this habitat each jaguar takes much longer to find food or a mate than its peers in the Amazon or Pantanal, for example.

As they wander ever farther afield because of this fragmentation, the few remaining jaguars risk increasingly frequent contact with humans, who pose multiple threats. The felines are hunted, run over by traffic, killed by ranchers in retaliation for livestock losses, and abused or murdered by fearful people who accidentally come across them.

A major international study containing some of these findings was published recently. One of the authors is conservationist Ronaldo Gonçalves Morato, head of the National Center for Carnivorous Mammal Research & Conservation (CENAP), a unit of the Chico Mendes Institute for Biodiversity Conservation (ICMBio) located in Atibaia, São Paulo State.

In another article, published in late December in the journal *PLOS ONE*, Morato and collaborators go beyond the conclusions of their research on jaguars in the Atlantic Rainforest to begin building a portrait of the jaguar's [movement patterns](#) in all five major Brazilian biomes and the risks they face in each biome.

"We set out to survey the jaguar's home range and movement parameters in each of Brazil's biomes—Atlantic Rainforest, Cerrado, Caatinga, Pantanal and Amazon—as well as northern Argentina," Morato said. An animal's home range is the territory it regularly covers in search of food and mates.

The researchers used GPS tracking to monitor 44 jaguars from 1998 to 2016 across different habitats representing the five biomes and an Atlantic Rainforest remnant in Argentina. The animals had previously been captured, sedated and fitted with a GPS collar.

The total number of jaguars monitored breaks down as follows: 21 in the Pantanal, 12 in the Atlantic Rainforest, 8 in the Amazon, 2 in the Caatinga, and 1 in the Cerrado. Half were male and half female. Their ages ranged from 18 months to 10 years, but the vast majority (41) were adults over 3 years old.

The GPS collars were programmed to report the animals' positions at intervals ranging from half an hour to 24 hours. Monitoring periods ranged from 11 days to 1,749 days, averaging 183 days, and the number of recorded locations ranged from 53 to 10,989, averaging 2,264. The total dataset consisted of 80,553 locations, the largest collection of jaguar movement data analyzed to date.

"The collars had batteries that lasted about 500 days, but well before they ran out, usually after about 400 days of monitoring, we activated a device that released the collar from the animal's neck. We attempted to

retrieve collars for reuse but it wasn't always possible," Morato said. In some cases, he explained, the collar was not in a reusable state even if it was found.

"We know the animal has died if the GPS signal stays at the same spot for 24 hours. In that case, an automatic alarm is triggered," he said.

"That's what happened in the northern Pantanal in 2010, when a jaguar attacked and killed a fisherman. There were reprisals and several jaguars were killed in the area. We suspect that was how one of the animals in our project died."

According to Morato, about 80% of the animals had their home range in the areas monitored. The others displayed nomadic movement patterns or were migrating.

Males had larger home ranges than females, a finding consistent with the hypothesis that male carnivores' tendency to range over larger territories is linked to the distribution of females and the need to increase reproductive opportunities.

"Atlantic Rainforest jaguars had the largest home ranges and often had to venture into pasture or cropland to get from one fragment to another, risking contact with humans," Morato said.

Limited mobility

The jaguar with the largest home range (1,268 km²) inhabited the Cerrado. In Brazil, the jaguar with the smallest home range (36 km²) lived in the Pantanal. As a comparison, the area of Santa Catarina Island in southern Brazil is 424 km².

"For the first time we succeeded in comparing the movement and space use patterns of jaguars across different biomes," Morato said. "The next

step is to find out how they behave in different structures and landscapes. We want to identify the factors that limit their mobility in each biome."

It is important to know what limits jaguars' mobility, he explained, because their health depends on genetic variability, which in turn depends on each individual animal's ability to find a mate from another group outside its own family. The logic is the same as the avoidance of marriage between first cousins among humans, for example.

More information: Ronaldo G. Morato et al. Space Use and Movement of a Neotropical Top Predator: The Endangered Jaguar, *PLOS ONE* (2016). [DOI: 10.1371/journal.pone.0168176](https://doi.org/10.1371/journal.pone.0168176)

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