

Sloth survival under threat due to climate change, study finds

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Credit: Dr. Rebecca Cliffe

A new *PeerJ* study has revealed that sloths, the famously slow-moving creatures of Central and South America, may face existential threats due to climate change. The research, conducted by scientists studying the

metabolic response of sloths to rising temperatures, suggests that the energy limitations of these animals could make survival untenable by the end of the century, particularly for high-altitude populations.

The study, titled "[Sloth Metabolism May Make Survival Untenable Under Climate Change Scenarios](#)," investigates how two-fingered [sloths](#) (*Choloepus hoffmanni*), living in both highland and lowland regions, respond to varying [ambient temperatures](#).

Using indirect calorimetry, researchers measured oxygen consumption and core body temperature of sloths under conditions mimicking projected climate changes. Their findings indicate a troubling future for sloths, especially those residing in high-altitude areas.

Lead researcher Dr. Rebecca Cliffe explained, "Sloths are inherently limited by their slow metabolism and unique inability to regulate body temperature effectively, unlike most mammals. Our [research](#) shows that sloths, particularly in high-altitude regions, may not be able to survive the significant increases in temperature forecast for 2100."

The research found that sloths from highland regions experience a sharp increase in their resting [metabolic rate](#) (RMR) as temperatures rise. In contrast, lowland sloths, while better adapted to higher temperatures, initiate metabolic depression as a survival mechanism when temperatures exceed their [comfort zone](#), known as the "thermally-active zone" (TAZ).

By the year 2100, with projected temperature increases between 2°C and 6°C in sloth habitats, high-altitude sloths are predicted to face a severe metabolic burden. Their limited energy-processing ability, combined with minimal geographical flexibility, may prevent them from adjusting to the warming climate.

Sloths' slow digestion rate, which is up to 24 times slower than other

similar-sized herbivores, poses another challenge. Any increase in metabolic demand due to climate change cannot easily be met by increased [food intake](#), making it difficult for sloths to maintain energy balance.

The most concerning aspect of the research is the fate of high-altitude sloths. Due to their restricted ability to migrate to cooler regions and limited metabolic flexibility, these populations could face extinction if temperatures continue to rise.

The study suggests that while lowland sloths may cope by shifting their ranges to higher altitudes, highland sloths are geographically constrained and may not have this option. This biological inflexibility, paired with the increased metabolic demand in warmer climates, could push these populations toward a survival crisis.

The findings highlight the need for urgent conservation efforts to protect sloth populations, particularly those in high-altitude regions, from the impacts of climate change. The research team calls for further investigation into adaptive strategies and conservation policies that can help mitigate the risks sloths face in a rapidly warming world.

More information: Rebecca N. Cliffe et al, Sloth metabolism may make survival untenable under climate change scenarios, *PeerJ* (2024). [DOI: 10.7717/peerj.18168](https://doi.org/10.7717/peerj.18168)

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