

Executive Summary

HABITAT QUALITY AND INTEGRATIVE CONNECTIVITY ANALYSIS FOR *CALLICEBUS OENANTHE* IN SAN MARTIN, PERU

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The San Martín titi monkey (*Callicebus oenanthe*) is a critically endangered primate of north central Peru. As an endemic, *C. oenanthe's* small geographic range, coupled with some of the highest deforestation rates in South America, highlights its inherent vulnerability. Between 2000 and 2011 alone, San Martín experienced the highest gross forest cover loss of any other department in the country. Moreover, it was recently added to the IUCN's list of the top 25 most endangered primates in the world. To date, there is very little known about *C. oenanthe*. This is due, in part, to the species' cryptic nature and preference for the forest canopy.

The massive deforestation in San Martín threatens *C. oenanthe's* continued survival because as more forest is cleared, its' habitat is fragmented into discrete forest patches. As more patches are created, patch size will decrease over time. Small, disconnected patches threaten *C. oenanthe* due to associated negative feedbacks, such as facilitating invasions and hunter access, eliminating certain food sources, shifting environmental conditions, or increasing inbreeding depression. In time, these feedbacks can lead to patch extirpation on a small scale, and eventually species extinction on a large scale. Proyecto Mono Tocón (PMT), a local non-profit established in 2007, works to protect this species through field studies, community engagement, and environmental education activities. However, they have been unable to conduct a landscape scale assessment for this species. Therefore, this study was designed to complement PMT's efforts through a remote sensing and geospatial evaluation of *C. oenanthe's* remaining suitable habitat.

While primates remain one of the most well studied animal groups, most research has not focused on their response to landscape scale changes. Therefore, this study provides a landscape scale analysis in order for PMT to more efficiently and effectively prioritize their conservation decision-making. This was accomplished through the development of the first land cover map for *C. oenanthe's* entire distributional range using high-resolution satellite imagery. Additionally, a connectivity analysis was conducted to simulate movement and identify areas that both facilitate and impede connectivity across the landscape. Connectivity analysis is becoming a prominent strategy in conservation biology, particularly as deforestation fragments habitats into more discrete patches. Because *C. oenanthe* prefers to move across the landscape via the forest canopy, any gap between canopy cover effectively isolates this species. As such, protecting or reforesting corridors between remaining habitat patches will be a vital part of any management strategy. With this in mind, the connectivity analysis employed least-cost paths to identify areas that both aid and obstruct movement. In addition, mining concessions located in the range were also evaluated for their potential impact. Currently, mining is not a primary economic driver in the region; however, there is reason to believe that this may change into the

future. With over 100 mining concessions authorized in San Martín, their development could be ecologically devastating to this species. Finally, all of this information was integrated into a prioritization tool that allows PMT to make tradeoffs in conservation design into the future.

Results of this study suggest that more than one quarter of *C. oenanthe's* range has been cleared and of the 1.6 million ha of forest remaining, more than half of this is likely marginal habitat. Only 4% of the range overlaps with protected areas, and of these areas, 14% appear to have already been cleared, indicating that the protected areas that do exist are not protecting the biodiversity in the region as they had been intended to do. The connectivity analysis revealed nine patches that are completely isolated and that more than 90% of remaining habitat patches are likely too small to support viable populations. Mining concessions overlap with 6% of the range. Additionally, the analysis suggests that *C. oenanthe* will not only lose important corridors between habitat patches, but will also likely lose their highest quality habitat should these mining concessions become active. In total, the prioritization tool will allow PMT the option of 22 different attributes in which to inform their conservation decision-making.

If deforestation trends continue, which appear likely, results may be devastating for *C. oenanthe* and other threatened species of this area, as well as for local communities whose ecosystem services may be impaired. Because an overwhelming majority of habitat patches may be too small to support viable populations, reforestation programs to increase patch size or connect these sink to source populations would greatly help to limit the feedbacks that contribute to patch extirpation and extinction. Similarly, the nine patches identified as isolated should be evaluated to see if populations exist there currently. If any remain, these populations could be extremely important to target future conservation initiatives. This study also suggests that 14% of protected areas were classified as cleared, stressing the need for better enforcement to ensure these protected areas continue to support the biodiversity it was planned to protect. It is also disappointing that there is a greater percentage of mining concessions in the range than there are protected areas. The information provided by this study may be used by PMT to prioritize conservation targets as the ecological, political, and socioeconomic environments change. This flexibility allows for a dynamic management tool that PMT can utilize as spatial and temporal variations dictate.

Approved



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