Tamarin Tales

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Golden-headed lion tamarins in cabruca agroforest

- what we know and what we still need to know...

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Understanding how the golden-headed lion tamarin (GHLT - *Leontopithecus chrysomelas*) uses the matrix of habitat that surrounds forest fragments can contribute to formulating conservation strategies in fragmented landscapes.

The dominant vegetation type or habitat within the range of GHLTs is shaded cacao agroforest or cabruca (figure 1), as it is called locally in the State of Bahia. In the 1990's cabruca dominated the geographical range of GHLTs with around 40% of the landscape compared to 30% of forests areas within the landscape. However, a long-term economic crisis due to a decrease in the price of cocoa and the emergence of witches' broom (Moniliophthora perniciosa), a fungal disease that has been devastating Bahia's cocoa crops since 1989 and decreasing cacao production, was forcing landowners in southern Bahia to transform cabruca into other types of crops to increase their revenue.

Figure 1. Cabruca agroforest

Furthermore, the long-term survival of native forest trees found in *cabruca* is at risk due to current management practices and the natural death of forest trees. Given the rapid degradation of Atlantic Forest in Bahia, the endangered status of the golden-headed lion tamarin and the rapid changes in *cabruca* management, a better understanding of the relationship between agroforest

management and key resources found in *cabruca* emerged as an important conservation objective and a priority for the species (Holst et al. 2006).

This scenario motivated the initiation of *Cabruca* project which aims to address if and how GHLTs use or live in *cabrucas*. The project started officially in 2007. In the six years since field work started we have some important discoveries about the relationship of GHLTs with *cabrucas* and how this knowledge may help the conservation of the tamarins. Based on the results the project produced, we have good information on tree species that can be used in habitat restoration or cabruca management.

There are at least 55 species, which are used as food source or sleeping site, and thus can be considered

Figure 2.

Extremely Valuable for GHLTs and could be used for the purpose mentioned above. We also discovered that GHLTs do not only use *cabrucas* as part of their home range, as suggested by other authors in 1990's and confirmed in 2000's, but they can reproduce very well in this agroforest, with twins in every reproductive season.

The density of GHLTs is also very high in cabruca reaching up to 2 individuals per 10 hectares, although group size averaged 7.4 individuals, and was not significantly different between vegetation types. Home ranges in *cabrucas* were smaller than compared to other vegetation types and GHLTs were also larger and heavier in cabruca than in other vegetation types. These results can probably be explained by the abundance, both spatially and temporally, of jackfruit, *Artocarpus heterophyllus* (Figure 2) an exotic invasive species in *cabrucas*.

Despite this apparent good adaptability to *cabrucas*, our research did show that GHLTs are much more at risk of predation in cabruca compared to other types of forest. The number of encounters between GHLTs and potential predators, mainly raptors, is almost four times higher in cabruca than in other forests.

In order to avoid predation GHLTs associate with Wied's marmosets (Figure 3). However, structural limitations

of cabruca lead to groups in cabruca being forced to use the higher levels of the forest compared to mosaic forest, exposing themselves more to aerial predators as highlighted by Almeida-Rocha (2012).

As part of a behavioral study, we discovered that the activity patterns of GHLTs in cabruca is similar to that found for other populations in different habitats, although the daily travel distance is lower in *cabruca*, probably due to the abundance of jackfruit, a highly energetic food source.

Figure 3.

Thus, our research results to date show that lion tamarins can live and reproduce in some types of cabruca agroforest, with demographic and ecological and behavioral aspects apparently similar to groups that live in native forest habitats, despite the higher predation risk they are exposed to in *cabrucas*. However, cabruca areas, even those in close proximity to each other, vary in richness and density of overstory trees and consequently in forest structure. Understanding whether and how GHLTS use the range of different cabruca types will help, for example, in refining estimates of the number of lion tamarins in the wild.

Also, studying how GHLTs use the resources (fruits and animal prey) in different types of *cabrucas* may help to understand their success and constraints in such habitats. Identify structural and floristic characteristics of *cabrucas* that can be used to predict the presence or absence of GHLTs in this agroforest or the type of use is also crucial since it can be the basis for strategies aiming at incorporate value to cacao (or rather cabruca plantations) by creating a certification for those farms that produce such GHLT's friendly cacao.

This action may be instrumental for halting cabruca conversion by increasing the price of the cacao while reducing the pressure to increase overall production (which is generally done by intensifying production and may require a decrease in the number of shade trees on cacao plantations and hence a decrease in available GHLT resources).

The next steps in cabruca studies are likely to provide even more crucial information for shaping GHLT's conservation.