Understanding population parameters and dynamics of carnivores is vital to protecting these threatened taxa and the ecosystems they inhabit\(^1\). Across the globe, carnivores are especially vulnerable to various anthropogenic pressures (e.g., deforestation, habitat fragmentation, introduced exotic carnivores) due to their relatively small populations and large home ranges\(^1\). Madagascar’s carnivores (Family Eupleridae) are no exception as they are among the least-studied and most-threatened carnivores in the world\(^2\). Research is sparse on these mammals, and to date, no studies have been conducted on populations occupying one of Madagascar’s most important protected regions: the Andasibe-Mantadia landscape.

We conducted the first survey and estimation of carnivore populations in this area using photographic sampling across three protected forests (Analamazaotra, Mitsinjo, VOI). We focused on fosa (*Cryptoprocta ferox*), Madagascar’s largest and most widespread carnivore and an umbrella species for this threatened region, meaning protection of this top carnivore can result in the protection of a wealth of biodiversity occupying the same habitat\(^3,4\). Using the program Presence\(^5\), we estimated naive occupancy (occupancy not accounting for probability of detection) and detection. We investigated variables influencing these parameters, including human detection and human-altered environments (e.g., villages, roads, forest edge).

With 24 camera stations, 19 sampling days, and 362 trap nights, we found fosa trap success was 1.29, with 5 captures and a naïve occupancy estimate of 0.22. These figures do not refer to numbers of fosa; rather, they are indicative of fosa detectability and prevalence within the study area. Due to a limited study period and decreased winter activity, our models were unable to estimate true occupancy (e.g., accounting for imperfect detection), which is likely much higher than naïve occupancy indicates. However, our results still indicate fosa are negatively affected by humans and human-altered environments (Figure 1). Distance to forest edge best explains fosa detection (\(\Delta AIC=0.00\), AIC Weight=0.552), but fosa detection displayed a negative relationship with distance to road, distance to anthropogenic area, and human detection as well. These factors also likely threaten other endemic wildlife, such as endangered lemurs, in this region.

We are currently analyzing data from a more expansive survey conducted across these sites during warmer months (October-November 2017) to compare estimates across seasons. With the longer survey during Madagascar’s summer, we anticipate fosa trap success and detection will increase, and our models will be able to estimate occupancy. Further research is needed to provide such estimates for other elusive native carnivores in the region.

Fosa are one of the least-studied carnivore species in the world, and their vulnerable status and umbrella species role makes studying and managing them particularly important\(^2,4\). This study’s findings have direct implications for management relating to this tourist-driven conservation area. Having more robust, reliable estimates of fosa populations in this region will allow Madagascar National Parks and local non-governmental organizations (e.g., Association Mitsinjo) to make more informed conservation decisions for threatened carnivores. Additionally, this information will provide insight on relationships with local people, their behaviors, and their domestic animals, all of which pose serious risk to Madagascar’s imperiled wildlife.

**Statement of Research Advisor**

For his research project, Cullen conducted the first robust survey and estimation of the native and exotic carnivore populations across the Andasibe-Mantadia region of Madagascar, thus providing the government of Madagascar (Madagascar National Parks) and local NGO’s (Association Mitsinjo) with critical population estimates and a thorough evaluation of the impacts of anthropogenic pressures on native, threatened wildlife.
He is currently working to disseminate these important findings via publications and professional presentations at national and international meetings.

—Zach Farris and Sarah Zohdy, School of Forestry and Wildlife Science

References


Figure 1. Relationships between fosa detection and camera distance to edge, distance to anthropogenic area, and distance to road from camera survey across three protected forests in the Andasibe-Mantadia region of Madagascar from June 7th to June 25th, 2017.