DUCIGS Summer Research Award Report

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I spent six weeks this summer in Amboseli National Park, Kenya collecting data on wild baboons. The population of baboons just outside the park has been studied for over four decades, and we (a group of PIs and grad students at Duke, Notre Dame, and Princeton) have a wealth of longitudinal data on their demographics, life history, social behavior, and environmental data.

I arrived in Amboseli with to main goals: to take parallel-laser photogrammetry data of the baboons, and to collect both fresh urine and urine-soaked soil from baboons. These two data types – the photos and urine – can tell us exciting information about baboon physiology and morphology, and that information can be linked to information on each baboon's development, behavior, survival, and reproduction. Below, I'll briefly describe the two methods and how I collected these data in the field.

Parallel-laser photogrammetry:

In this method, two lasers are attached to a camera. The lasers project 4cm apart regardless of distance from the subject, creating a scale within the photo. When photos are taken of individuals, they can be used to take various measurements of body size (e.g., shoulder-rump length, shoulder-elbow length).

Recent studies of gorillas (Galbany et al., 2015; Galbany et al., 2017) and geladas (Lu et al., 2016) have demonstrated that it's feasible to distinguish age-sex classes and create growth curves in primates. If this project continues, I think it would be feasible to create individualized growth curves and relate those curves to life history data in the baboons. For example: Does maternal death during early life slow the growth and stunt adult body size of baboons? Do any other factors (e.g., large number of relatives in the group) buffer against growth differences?

To collect these data, I attached the laser apparatus to a camera, and I tried to get as close to the baboons as possible without alarming them. This distance tends to vary by individual, time of day, whether I'm wearing sunglasses, etc. I tried to take photos of them while their spines were perpendicular to my lens. I soon learned that some daily activities, such as feeding on tortilis pods on the ground, were especially conducive to taking photos. I also learned that the infants and young juveniles were tricky! Not only are their bodies barely big enough to fit both lasers, but they jaunt around and hardly seemed to stay still. It seems most of their time is spent jumping on each other, pulling each others' tails, and cuddling with mom.

Urine:

With lots of help, I collected both fresh liquid urine and urine-soaked soil. Our first attempts to collect liquid urine involved plastic tarps laid out under the sleeping trees, and it resulted in cleaning off lots of baboon poop. One of the research staff and I developed an easier method in which we stood under the sleeping trees with high-tech collection equipment: a bent wire hanger duck taped to an old mop, with a bag attached to the end. We collected a lot of urine this way, which will be extremely helpful to compare against the urine-soaked soil data. Since we don't yet have an export permit, I spent three days at

the Institute of Primate Research in Nairobi running some analyses of the urine for pilot data.

Urine-soaked soil samples are collected opportunistically once the baboons came down from the sleeping trees. I rotated through a number of different methods of collecting the soil, but eventually decided that the easiest method was also the most effective. After spotting a sample, I used tubes to scoop up one urine sample and one reference sample of dry soil next to the urine. The reference sample will be used to control for pre-existing moisture, salts, and urinary compounds in the soil. Samples were frozen to prevent microbes from breaking down the urinary compounds of interest.

Urine contains some exciting hormones, as well as indices of physiology and health. Studies of primates have validated methods for assaying urinary creatinine (associated with lean body mass; Emery Thompson et al., 2012), c-peptide (associated with energetics; Higham et al., 2011), and neopterin (associated with immune function; Heistermann & Higham 2015). Urine also contains peptide hormones, such as oxytocin and vasopressin. And like feces, urine contains steroid hormones, such as cortisol and testosterone.

The biggest hurdle with this project now is creating a protocol for quantitative assay of these compounds from urine-soaked soil; the liquid urine collection is not feasible long-term. My advisor and I have been in communication with some soil researchers at NC State to figure out efficient methods for urinary compound extraction.

Final thoughts:

As usual, field work is never quite as productive as you plan for it to be. It's impossible to imagine all the things that could go wrong, and invariably something you hadn't planned for (in my case, finicky lasers and a broken lab scale) forces you to get creative. Given all the moving parts, I'm excited about the data we collected this summer, and it will give me lots to study in Durham this year!

I also feel privileged to be able to do my science in such an incredible location. Baboon camp is comfortable enough to call home but not too fancy to forget you're in the field: outdoor showers, views of Kilimanjaro, camp-dwelling mongooses, an incredibly kind and knowledgeable group of staff and researchers, and nighttime noises of hyenas, elephants, and lions. Til next time, I'll need to find a "safari sounds" audio to fall asleep to.