

cold, wet, and covered in blood

MAI FAHMY TN'20

It was June 2014, and I was walking through Ranomafana National Park in Southeastern Madagascar for the very first time. I was one of 15 study-abroad students marching through the forest as the rain pounded down. We were learning field techniques in behavioral primate research, soaking wet and looking for lemurs. After a long hike in the rain, I retreated to my tent to peel off my freezing clothes. It was then I learned I had served up a satisfying meal to several of Madagascar's tiny terrors: the terrestrial jungle leeches. Quite literally a bloody mess. I quickly learned that in Madagascar's rainforests, it can be difficult to distinguish between the pouring rain, cold wet leeches, and your own blood soaking through your clothes. I can confirm all three sensations feel identical, which makes for an interesting guessing game while hiking in Madagascar. At the time, I was caught off guard but generally unbothered by these blood-sucking worms. At the time, I would have never imagined that leeches would bring me back to Madagascar over and over as the subject matter of my doctoral dissertation.

At the end of my undergraduate study abroad experience, I was utterly captivated by Madagascar's unique, endangered biodiversity, and I knew that I would be returning to conduct my own research. Shortly after starting my doctoral program, I came across a fascinating study which used leeches as samplers of host DNA. The study was exciting and innovative, and I jumped at the opportunity to join the team at the

American Museum of Natural History working on this impressive research.

I have had many leech encounters since and have been fortunate to return to Madagascar a handful of times for my dissertation. No bigger than a few centimeters, the leeches of family *Haemadipsidae* lurk in the moist forests of the Indo-Pacific, from Australia and Southern China all the way to Madagascar. Just about anyone who has worked in this region has had a personal, often annoying, experience with terrestrial leeches. They are generally harmless and not known to be vectors for human illness, but in the tropics their bites can quickly become infected like any other cut or scrape. Leeches thrive in primary forests where canopies are large, and the understory is humid. They lay in wait in moist patches of forest and latch as hosts (hikers included) brush up against vegetation. Because they release anticoagulants while feeding, their hosts bleed disproportionately to the size of the incision. The experience is usually distracting, and sadly most never notice the stunning colors and intricate patterns leeches exhibit.

For my dissertation, I am streamlining and standardizing the use of terrestrial leeches for biodiversity surveys. The technique is known as iDNA (for invertebrate DNA) and involves dissecting the posterior region of the crop, isolating bloodmeal DNA, and amplifying genes diagnostic for identifying vertebrate fauna. I have learned leeches feed only occasionally and can preserve

the DNA of up to four distinct host species. My data show they feast indiscriminately on mammals, birds, reptiles, and amphibians, making them highly efficient in detecting species across taxonomic groups. Overall, leeches are proving to be particularly valuable for establishing baseline species richness measures of small, elusive, camouflaged biota.

My research also involves studying the diversity of leeches themselves, as understudied organisms. Because they are small and soft bodied, leeches are difficult to dissect while maintaining the integrity of their anatomy. With micro-computed tomography (μ CT), scientists have been able to keep specimens intact while investigating their internal morphology. μ CT scans reveal elaborate reproductive structures, which are diagnostic characteristics, and have been used to describe two new species of terrestrial leech. In Madagascar, there are five known species, one of which I discovered during my 2017 expedition to Ranomafana National Park. Samples from my 2019 expedition to southcentral Madagascar with TEC's Fjalraven Field Grant suggest a putative sixth species. There is still much to learn about leech diversity, but what is apparent is that there are still many species to be discovered.

My journey with leeches has been personally and professionally rewarding. I have learned much since my first field season and through my research I hope to raise awareness and inspire appreciation for these beautiful and truly helpful parasites.



Dorsal pattern of leech collected in plastic bag, Analamary-Ivohibory Community Forest. Photo: Mai Fahmy



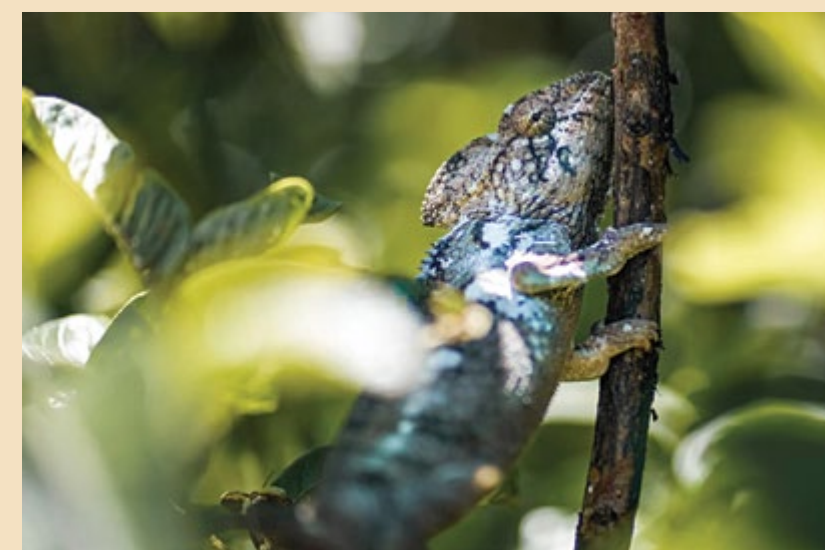
Leech feeding on Fahmy's face. Ranomafana National Park. Photo: Mariah Donohue



A curious *Eulemur rufifrons*, Centre ValBio Research Station. Photo: Kimberly Sauer.



Resting *Lemur catta*, Anja Community Reserve. Photo: Kimberly Sauer



Chameleon, *Furcifer* spp., Anja Community Reserve. Photo: Kimberly Sauer



The mighty Namorona River. Ranomafana National Park, Madagascar. Photo: Kimberly Sauer