Disease Ecology, Conservation and Global Health:

Duke Team Lands NIH Grant to Work in SAVA

by Charles Nunn and Randall Kramer

Infectious disease represents a major threat to people living in Madagascar. These threats include so-called "zoonotic" diseases, i.e. diseases that are maintained in domesticated animals or wildlife and spread to humans. A prominent example of zoonotic disease in Madagascar is plague, caused by the bacterium Yersinia pestis and maintained in rat populations. A recent outbreak of plague in Madagascar in 2017 led to over 2000 documented cases and 171 deaths. Another well-known example is Leptospira, a bacterium spread in urine that infects a wide range of domesticated and wild animals. Human health effects of leptospirosis include fever, abdominal pain, headache, and vomiting; without proper treatment, leptospirosis can lead to kidney or liver failure, meningitis, and even death.

Field assistants Tio, Herlin, and Flavian/Robert setting traps used to catch rats

We recently launched an **NIH-supported** project aimed at investigating infectious diseases at the human-animal interface in the SAVA region. Our highly interdisciplinary team of ecologists, economists, mathematicians and sociologists aims to model disease transmission within and across small mammals (rats, bats, and tenrecs), domesticated mammals (cats, cows, pigs, and dogs), and humans. We will do this by screening humans and animals for a wide range of diseases, undertaking rigorous surveys of people and their environments, and conducting sophisticated mathematical modeling to represent connections between humans and animals in a network framework.

We will engage with two facets of conservation biology and global health in our research. In terms of conservation, we will examine disease transmission in relation to different types of land use. Our findings will enable us to identify the linkages between human activities – such as different types of farming – and infectious disease risks to humans. In terms of global health, we will identify the sources of health disparities: what are the factors that lead some individuals to be at the "front lines" of zoonotic disease transmission, and thus conduits of zoonotic disease to others in the population? These health disparities are central to understanding global health challenges, and to developing appropriate interventions.

Field assistants Jackson and Jean-Yves working with Duke undergraduate Miranda

Throughout our five-year grant, we will continue to build relationships with Malagasy health administrators, doctors, veterinarians, research assistants, students, and faculty. These partnerships are crucial for our success in the field, and also for implementing any changes to reduce deforestation and improve health. We are grateful to the SAVA Conservation Initiative's collaboration and logistical support, including helping to set up many of our partnerships on the ground in Madagascar.