

## EcoHealthNet 2022 Research Exchange Project Descriptions

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<b>Project Title</b>	<b>Host Organization</b>	<b>Student Level</b>	<b>Openings</b>	<b>Project Description</b>	<b>Skills</b>
<b>Health Impacts of Changing Landscapes in Indigenous Lands in the Pan-Amazon</b>	EcoHealth Alliance	Graduate	1	This project aims to understand how forest fires in the Brazilian Amazon are affecting the health of indigenous populations, and what role indigenous territories play in mitigating these effects, in order to support policies to protect and defend indigenous land ownership. The student will be responsible for modeling future scenarios of land-use change and deforestation in the Amazon and analyzing how this would impact indigenous health and the provision of ecosystem services (especially the absorption of pollutants and carbon stocks).	The candidate should have a background in ecology with experience in GIS, R and data analysis.
<b>Multifunctional Landscapes for Zoonotic Diseases in Brazil</b>	EcoHealth Alliance	Graduate	1	This project aims to understand how land-use change and landscape configuration affect the transmission risk of multiple zoonotic diseases, as well as to understand the differences and similarities between the drivers for the different diseases in order to design landscapes that pose minimal risk to human health. The student will be responsible for organizing the data collected on different pathogens, extract landscape metrics, and perform data analysis.	The candidate should have a background in ecology with experience in GIS, R and data analysis.
<b>Conservation Works, Liberia</b>	EcoHealth Alliance	Undergraduate	1	This project aims to establish a program for Payment for Ecosystem Services in landscapes around Protected Areas in Liberia. The student will be responsible for conducting a systematic literature review about the different Payment for Ecosystem Services established in tropical areas. This review will be used to guideline pilot Payment for Ecosystem Services in Liberia.	The candidate should have a strong data literacy and scientific writing skills.
<b>Comparative genomics and evolutionary analysis of Nipah Virus genomes</b>	EcoHealth Alliance	Graduate	1	The student will contribute to an in-depth evolutionary analysis of Nipah virus genomes. This work will include collecting and organizing all available Nipah virus genomes, producing alignments, building basic phylogenetic trees and evolutionary selection analysis. Certain Nipah virus strains have distinct tropism and virulence, suggesting that specific genotypes influence relevant phenotypic differences. The goal of this project is to generate hypotheses that highlight specific genomic regions or genetic changes that can be further investigated to link viral genotype to phenotype.	The candidate should have familiarity with concepts in phylogenetics, genetics and evolutionary biology.

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Project Title	Host Organization	Student Level	Openings	Project Description	Skills
<b>Prototyping a device for contact-free collection of biological samples from wildlife</b>	Smithsonian Conservation Biology Institute (SCBI)	Graduate	1	Emerging infectious diseases and pandemic threats demand continuous monitoring of both pathogens and health status of wildlife living in areas where human-wildlife contact is frequent. Such monitoring is currently done by collecting blood/tissue samples of the target animals, frequently requiring chemical immobilization and capture of the animal. Such a model of sampling imposes morbidity and mortality risks to the animals due to stress, are logistically complex and expensive, and put both humans and animals at risk of transmitting diseases to each other during the sampling. This project aims to build an autonomous device capable of collecting biological samples from wildlife without the need for human contact. Furthermore, the device will also have the ability to perform in situ diagnostic testing and transmit results to nearby research stations, allowing for near real-time health monitoring of the wildlife living in the area. Selected candidates will be expected to contribute to the design and prototyping of the device. Activities will include working with a multidisciplinary team that includes electronic and mechanical engineers, life scientists, and wildlife specialists to design, prototype, and on-site lab test a device for contact-free collection of biological samples. Device prototyping can be performed at the student's site provided she/he/they have access to suitable 3D printers and related equipment.	Background in mechanical construction and/or industrial design is a must. Previous experience in 3D printing and Arduino is a plus.
<b>Non-invasive bio-monitoring of persistent organic pollutants through feathers and hair of domestic and wild animals: a pilot study for sentinel One Health surveillance</b>	Smithsonian Conservation Biology Institute (SCBI) & University of Florida	Graduate	1	Persistent organic pollutants (POPs) such as pesticides, plasticizers, and flame retardants are ubiquitous in the environment. Their negative effects have been noted in numerous organisms, from bacteria to apex predators and humans. Monitoring for these chemicals in wildlife can provide valuable data on both environmental and organism contamination; however, this approach commonly involves sampling organ tissues (such as liver, adipose, kidney) postmortem which minimizes our ability for repeated sampling and tracking, limits monitoring of sufficient animal numbers for statistical power, and raises ethical issues of sampling animals especially threatened wildlife species. Quantifying chemical concentrations in feathers and hair presents an opportunity to better understand exposure and risk to animals in varied environmental settings using a non-invasive approach. This pilot study will evaluate the use of feathers and hair to monitor POP levels across animal species, as an assessment of environmental risk of contamination and sentinel surveillance for humans, livestock, and wildlife. The student will assist in testing feather and hair samples using mass spectrometry at the University of Florida using both a targeted and non-targeted approach, and analyze the results to help elucidate pollutant cycles and dynamics in the biotic environment.	Experience with literature searches and review, data analysis and basic statistics. Knowledge of pesticides and mass spectrometry is not necessary but is a plus.
<b>Pathogen Surveillance using Next Generation Sequencing in Bats of Kenya</b>	Smithsonian Conservation Biology Institute (SCBI) & Institute of Primate Research, Nairobi, Kenya	Graduate <i>*Kenyan resident only due to COVID restrictions</i>	1	Bats host many zoonoses of global public health impact. Human activities, such as encroachment into natural habitats, can increase exposure to bats and provide opportunities for infections to spill over from bats to other animals and humans. Kenya is home to >104 bat species, and with an increasing interface in rural communities, pathogen surveillance is a critical need. Opportunistic bat samples were collected as part of an ecological study, and will be screened for potential pathogens of public health concern using next-generation sequencing (NGS). The student will assist in organizing metadata to choose the best samples to test, undergo rigorous training in safe sample handling and laboratory protocols, learn how to perform DNA/RNA extractions and conversion to cDNA prior to NGS, and be involved in data analysis and presentation/publication of findings.	Experienced in, and ability to adhere to, strict biosafety and biosecurity protocols; familiar with laboratory procedures and testing methodologies. Interest in intersection of wildlife and human health.

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Project Title	Host Organization	Student Level	Openings	Project Description	Skills
<b>Assessing emerging risk factors driven by land use changes on pastoral communities' culture, behavior, and practices on TB incidence in Kajiado County, Kenya</b>	Smithsonian Conservation Biology Institute (SCBI) & Institute of Primate Research, Nairobi, Kenya	Graduate <i>Kenyan resident only due to COVID restrictions</i>	1	An increase of overlapping land use and contact among humans, wildlife, and livestock, coupled with cultural and behavioral practices, create opportunities for cross-transmission of tuberculosis (TB), thus undermining the eradication strategies of TB in Africa. Further, current available data on TB in animals are from assays that lack sensitivity and specificity. In addition, unpublished data from the Ministry of Health indicates high rates of Acute Febrile Illness (AFI) in some communities, including the Kajiado community. With climate change driving further land use change and practices, livestock populations have increased exponentially due to changes in vegetation and pasture availability and widespread use of camels and camel products. High livestock-wildlife-human interaction, concomitant with high incidences of TB and AFIs, requires a re-look on prevalence of TB in animals that may be serving as potential reservoirs for infection in humans. Human epidemiological data on TB and AFIs will be collected from medical records in Kajiado County hospitals as well as possible risk factors associated with transmission of TB among the pastoral communities in proximity of national parks including Amboseli and Tsavo West with high livestock-wildlife-human interactions. The selected candidate will be expected to develop independent research questions from the above project description, to include reviewing literature, collecting data and samples, conducting PCR to identify Mycobacterium spp., and data analysis.	The candidate should have experience in questionnaire development and administration, GIS data collection, R program, familiarity with TB epidemiology, knowledge of AFI both in humans and animals, previous experience working with rural African communities.
<b>Assessing pathogen prevalence in ticks in response to changes in microclimate and host interactions</b>	Smithsonian Conservation Biology Institute (SCBI) & Walter Reed Biosystematics Unit	Graduate <i>Kenyan resident only due to COVID restrictions</i>	1	This project is part of the Remote Emerging Disease Intelligence NETWORK (REDI-NET), a long-term, phased initiative to develop a collaborative network among domestic and international partnering institutions to address surveillance needs to effectively DETECT, PREDICT and CONTAIN potentially emergent zoonosis of human relevance and improve the accuracy and timeliness of the 'data-to decision' pipeline. Vectorborne diseases, particularly tickborne diseases, have a long history of emergence and due to climate change, vectorborne diseases will undoubtedly continue to emerge in the future. The interaction between a tick's abiotic environment and the tick-host-pathogen system are key to understanding pathogen prevalence in questing ticks. The tick's ability to maintain an acceptable level of body water (affected by the saturation deficit of water in the air and by relative humidity) is the main factor regulating their short-term questing behavior, in addition to host stimuli. We aim to understand how the microclimate experienced by ticks and tick-host interactions influence pathogen prevalence in questing ticks at 10 watering holes in Laikipia County, Kenya. We will collect microclimate variables (air temperature and relative humidity) using micro loggers placed at a vegetation height where ticks quest, record host visitation at the watering holes using camera traps and record fine-scale vegetation data such as vegetation height and vegetation species abundance using a pin frame. The selected student will work with already collected data and gain skills in methods used in this study such as tick collections, vegetation identification, camera trap data analysis, molecular testing of ticks for tick-borne diseases and downstream data analysis.in population density, food availability, competition for resources, etc.	Field experience with tick collection; knowledge of important wildlife and livestock tickborne diseases, experience in database management, experience in molecular techniques and use of R or other data analysis tool.

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Project Title	Host Organization	Student Level	Openings	Project Description	Skills
<b>Hazard posed by zoonoses in Nigeria's wild meat ('bushmeat') trade</b>	Smithsonian Conservation Biology Institute (SCBI)	Graduate	2	In West Africa, animal-sourced food supply-chains ("value chains") link consumers living in major cities with animal products from rural, peri-urban and urban areas. Movement of wildlife products along these value chains provides a route by which people can be exposed to wildlife-borne pathogens, in an environment where novel pathogens can quickly amplify and spread internationally. While there is growing evidence for the presence of zoonotic pathogens in traded and consumed wild meat, little is known about the zoonotic hazard posed by specific groups of pathogens - such as tick-borne diseases - through consumption of wildlife products. This project aims to assess the potential hazards posed by zoonotic pathogens resulting from the wild meat trade specifically in Nigeria. Selected candidates will begin by reviewing published and 'grey' literature on the geographic and host distribution of zoonoses across Nigeria, and trade in wildlife species for human consumption in the country and across its borders. These datasets will then be combined to evaluate which zoonoses pose the greatest hazard along wild meat value chains, and in wet-market environments in Nigeria.	Experience in systematic literature review techniques, experience statistics programs (such as R), preferably experience in statistical modeling (ecology/epidemiology), knowledge of zoonotic diseases.
<b>Identification of zoonotic disease risk associated with waterpoints and dromedary camels in Kenya</b>	Smithsonian Conservation Biology Institute (SCBI)	Graduate	1	Arid and Semi-Arid Lands (ASALs) cover over 70% of Kenya's area. These regions are most suited to mixed livestock keeping in pastoral and semi-pastoral systems. With climate change and growing populations applying increasing pressure in these landscapes, the role of dromedary camels for nutritional and livelihood security is increasing. There is relatively little research focus on the role camels play in disease transmission pathways between people, livestock and wildlife, which are abundant and free-roaming in these landscapes. Selected candidates will be expected to develop independent research questions investigating the importance of camels to zoonotic disease transmission between people, livestock and wildlife, with a focus on dynamics around shared waterpoints in Kenya.	Data analysis skills in R; Independent research ethic; Experience in a One Health approach; GIS skills; Experience working in Kenya/Africa, preferably on livestock and/or wildlife.
<b>Understanding the contribution of environmental factors in the spread of antimicrobial resistance around Akagera National Park, Rwanda</b>	Smithsonian Conservation Biology Institute (SCBI) & Rwanda Development Board, Rwanda	Graduate <i>Rwandan resident only due to COVID restrictions</i>	1	Antimicrobial resistance (AMR) is a major challenge to global health. Monitoring and controlling AMR is particularly challenging in developing countries because of multiple factors including lack of surveillance systems, limited resources, poor adherence to infection control measures, injudicious use of antibiotics, and limited antimicrobial formulary. In Rwanda data about AMR are limited but recent studies at University Teaching Hospital in Kigali, indicated widespread prevalence of multi-drug resistant strain of numerous bacteria. This study will be conducted in Kayonza and Kirehe Districts, in the vicinity of Ndego rice and irrigation farms around Akagera National Park where there exists an intersection of agriculture activities with wildlife. Water and soil samples will be collected from this region and tested in country (at the Environmental Health Sciences Laboratory and the College of Agriculture and Veterinary Medicine, respectively). Clinical laboratory standards institutes (CLSI) guidelines will be used for choice of drugs and interpretation of drug susceptibility. To complement the laboratory results, a quantitative method will be employed to ask farmers, cattle keepers and community in the vicinity of Akagera National Park their perception on the role environmental aspects in the spread of antimicrobial resistance.	Familiar with laboratory procedures and testing methodologies for AMR assessment. Interest in intersection of wildlife and human health.

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Project Title	Host Organization	Student Level	Openings	Project Description	Skills
<b>Implementing a Knowledge, Attitudes, and Practice Study to Evaluate the Feasibility of a Rabies Vaccination Campaign in Namunyak, Kenya</b>	Smithsonian Conservation Biology Institute (SCBI) & Institute of Primate Research, Nairobi	Undergraduate (1) Graduate (1) <i>Kenyan residents only due to COVID restrictions</i>	2	One of the most important tools for reaching the World Health Organization's (WHO) 2030 goal of eliminating dog mediated rabies across Africa, where the disease kills nearly 21,000 people every year, is mass vaccinations of domestic dogs. Although demonstrated to be effective at eliminating rabies, mass vaccination campaigns of domestic dogs can be challenging to implement, especially in remote rural areas. Drawing on lessons learned from a grassroots vaccination campaign in nearby Laikipia County, Kenya (see study <a href="#">here</a> ), this project aims to implement a Knowledge, Attitudes, and Practice (KAP) survey in remote communities surrounding the Namunyak Wildlife Conservancy in Samburu County, Kenya in order to evaluate the feasibility, and desire for, mass vaccination in surrounding communities (e.g., Wamba, Lodosoit, Ngurnit, Barsaloi). Collecting data on community perceptions of rabies and their willingness to support a locally-led vaccination campaign is critical to effectively implementing future vaccination efforts. These data will be incorporated into the vaccination campaign planning process, including their use to develop vaccination strategies and implementation across this remote area.	Experience in veterinary science with a preference of knowledge related to rabies, experience working in remote communities under potentially harsh environmental conditions, familiarity with app-based data collection and GIS mapping software, knowledge of semi-structured questionnaires and analysis of survey data desirable.
<b>Connecting One Health research and National Public Health Institutes to improve surveillance systems in Africa</b>	EcoHealth Alliance	Undergraduate or Graduate	2	EcoHealth Alliance is engaged with the Africa CDC to improve One Health surveillance in Africa through partnerships between ongoing research occurring across the African continent and National Public Health Institutes tasked with responding to disease outbreak events. EHA and Africa CDC are working towards bridging the gap between public health surveillance and the extensive and dynamic primary research taking place across disciplines and subject areas. The EcoHealth Net project would occur over 6-12 weeks, and the student would be expected to perform a desk-top review of related research efforts occurring across the Africa CDC member states. The student would work under the mentorship of EHA data scientists to participate in the development of a database which will contain key information about active infectious disease research on the African continent that will serve as an information hub for National Public Health Institutes in Africa. The student will learn about data visualization techniques and will participate in meetings with colleagues in Africa to learn about event based surveillance systems. The student will also develop a research project using the database to identify gaps and opportunities in One Health research areas.	The candidate should have experience with literature review, scientific research, and statistical analysis