



GORILLA DOCTORS™

— Mountain Gorilla Veterinary Project & UC Davis Wildlife Health Center

Gorilla Doctors work in Africa: One health approach in Conservation

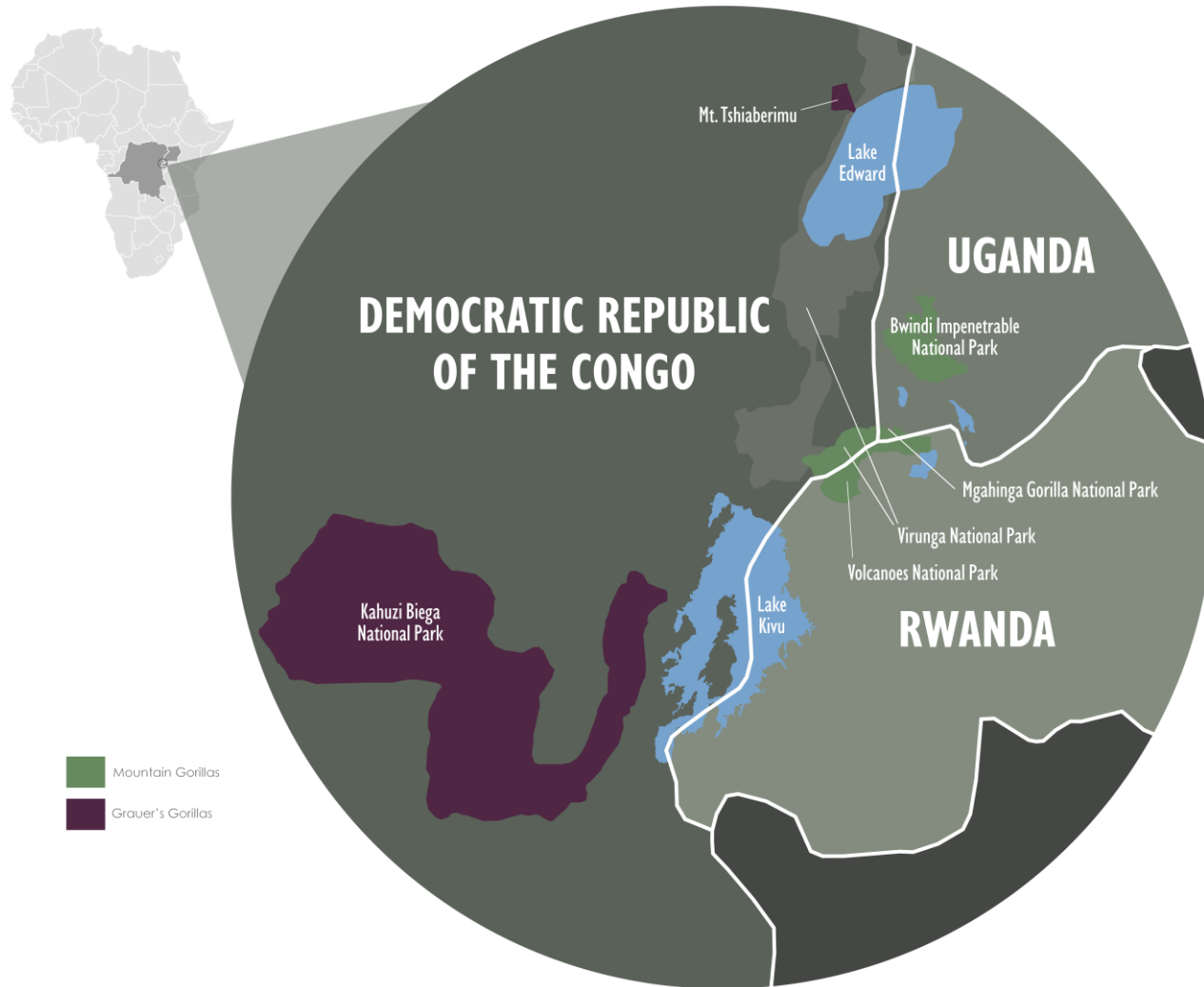
Presented by
Dr. Julius Nziza, Country Director
PhD Research Candidate

Disease Ecology & Veterinary epidemiology SIG

University of Glasgow, Sept. 14th 2023

Mountain Gorilla Veterinary Project: The Beginning





Our Footprint

- * 3 Countries
- * 6 Facilities
- * 15 Vets
- * Both subspecies of Eastern Gorillas
- * 37 Year History
- * U of Cal , Davis

Our Mission:

To conserve wild eastern gorillas through Life Saving veterinary medicine and science using a One Health Approach



Gorillas subspecies





Gorilla Doctors Impact

- 1,063 mountain gorillas
- Up to 4% of annual growth rate
- 550+ clinical interventions to treat ill or injured gorillas
- 40+ gorillas rescued from snares since 1995
- 1st on-site medical clinic for park staff and tourists

Our Goals

- **Restore the Gorilla Population**
- **Lead the Scientific Community**
- **Promote One Health**



Restore Gorilla Populations



Routine Health Checks

Gorilla Health Check Sheet – TITUS

Observer:	Date: Y/M/D	Start time:	End Time:	Total Number of people: (within 20 meters)
Observation location: RBM Altitude _____ m ZONE: 35M 0 _____ UTM				
General comments (remarks on the day's tracking exercise): name of place and vegetation, etc.				



Gorilla	Seen	Activity	Body Condition	Discharge (head)	Discharge (other)	Respiratory	Skin / Hair	Stool	Other Abnormals
Pato	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Seganira	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Kurudi	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Nshunguye	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Urwibutso	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Ndizye	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
Macibiri	NS S	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS SA	NS S
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Parameter Definitions

- 1. **Activity:** observe the animal for at least two to three minutes; if activity is in normal context with the other animals, enter "seen" and "normal".
- 2. **Body Condition:** you must see the chest and abdomen.
- 3. **Discharge Head:** you must see both eyes, ears, nostrils, and mouth.
- 4. **Discharge other:** discharge from any other orifice or lesion other than from the head.
- 5. **Respiratory:** you must be able to see the nostrils and chest.
- 6. **Skin/Hair:** you must see at least both arms and the front and back of the animal's torso.
- 7. **Stool:** one has to observe the animal defecating to answer seen.
- 8. **Other Abnormalities:** this is a free category and will be left "not seen", unless you see something that is unusual but not included in the other parts of the form.

Health Monitoring & Evaluation



Clinical Interventions

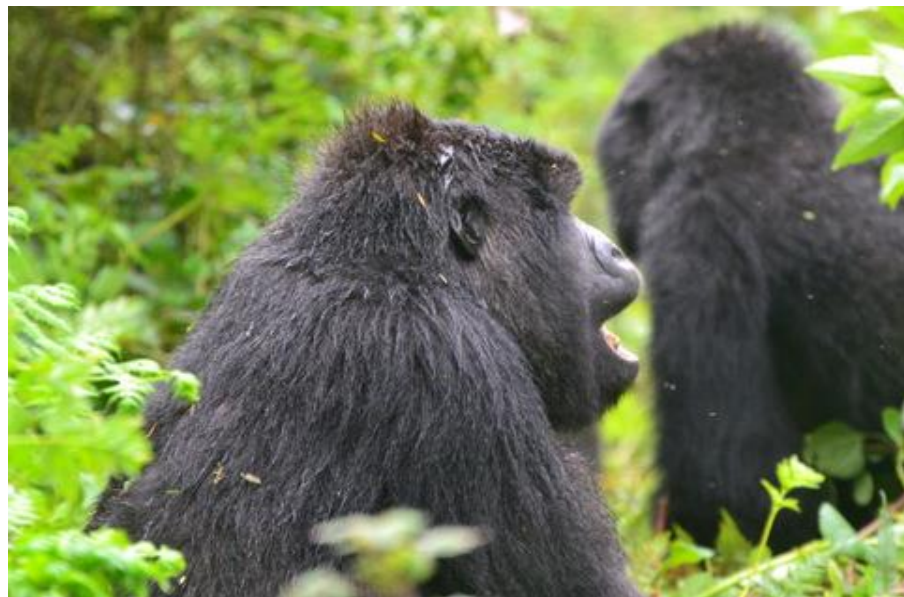
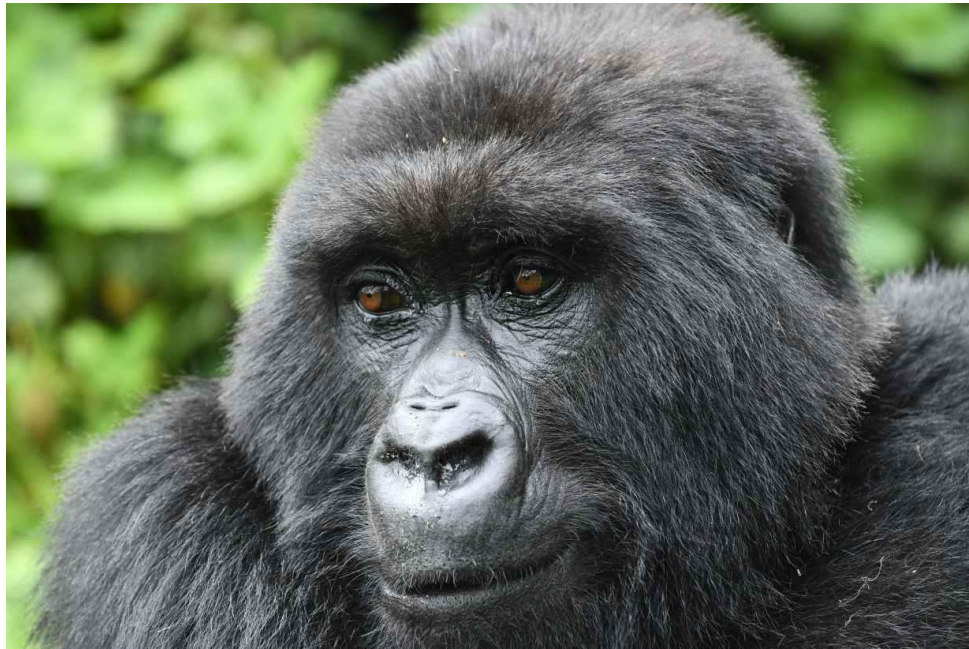
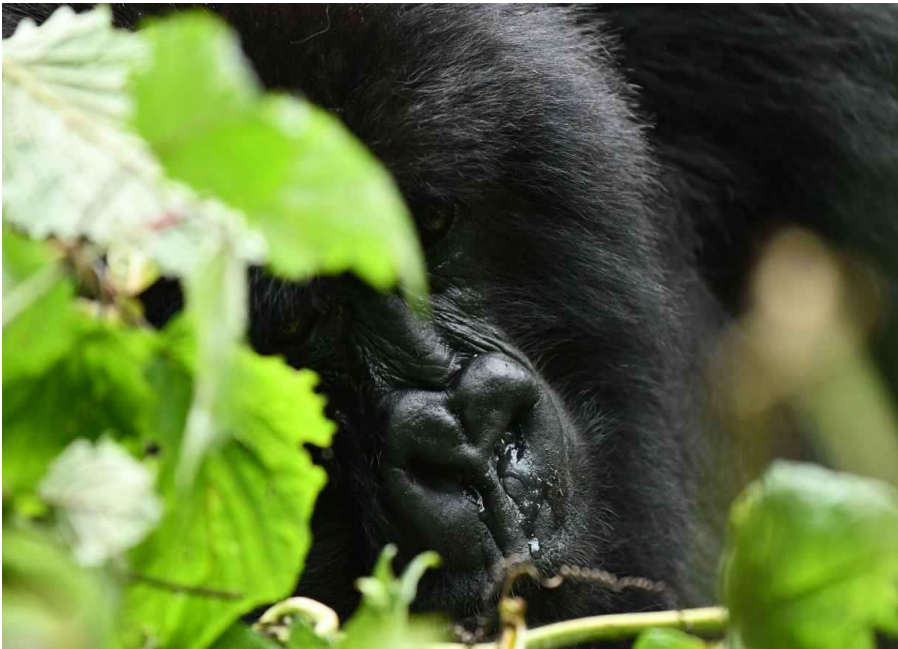


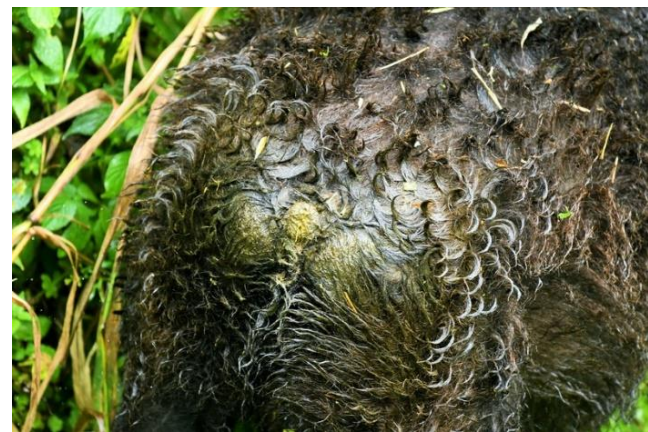
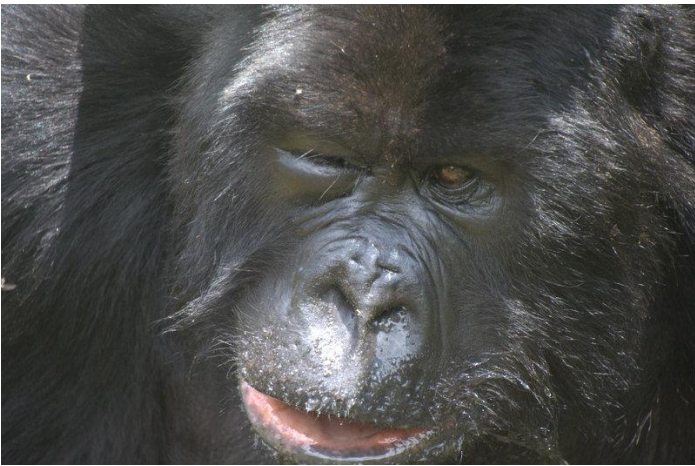
Only When Life-Threatening or Human-Induced

Snare removal: Major CI in the past.



Medical Cases: Infectious Diseases

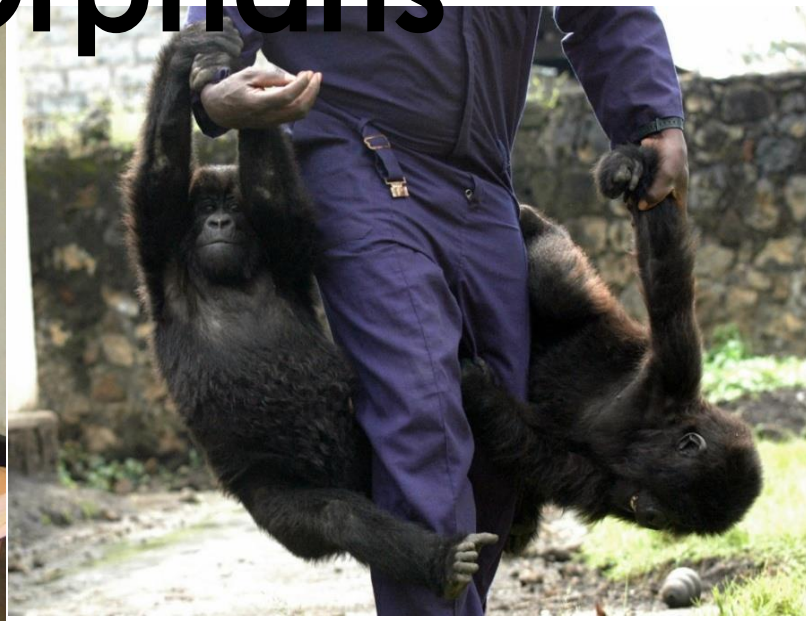




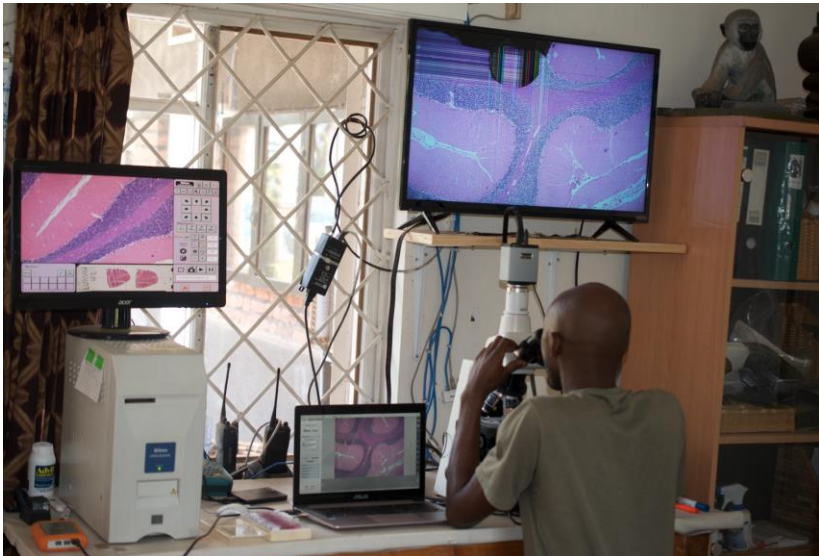
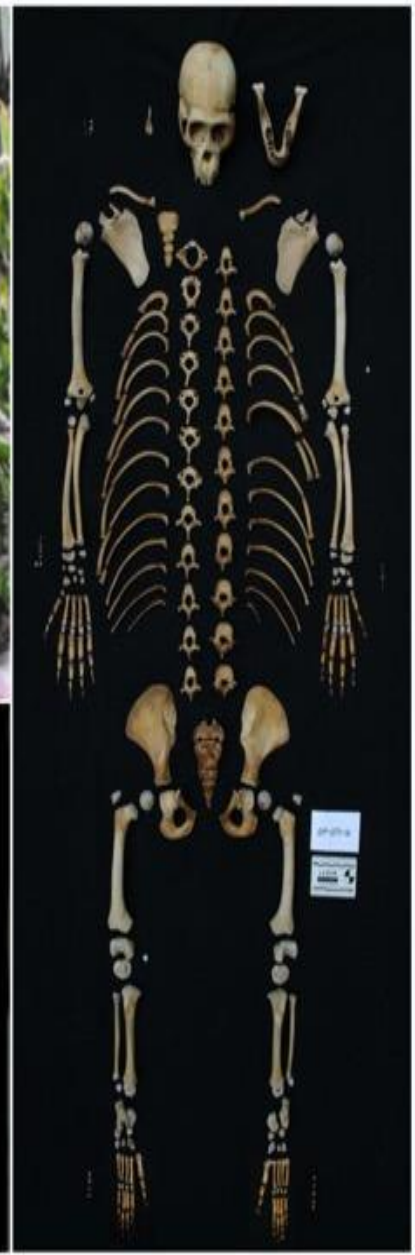
Traumatic injuries and infanticide



Saving Orphans

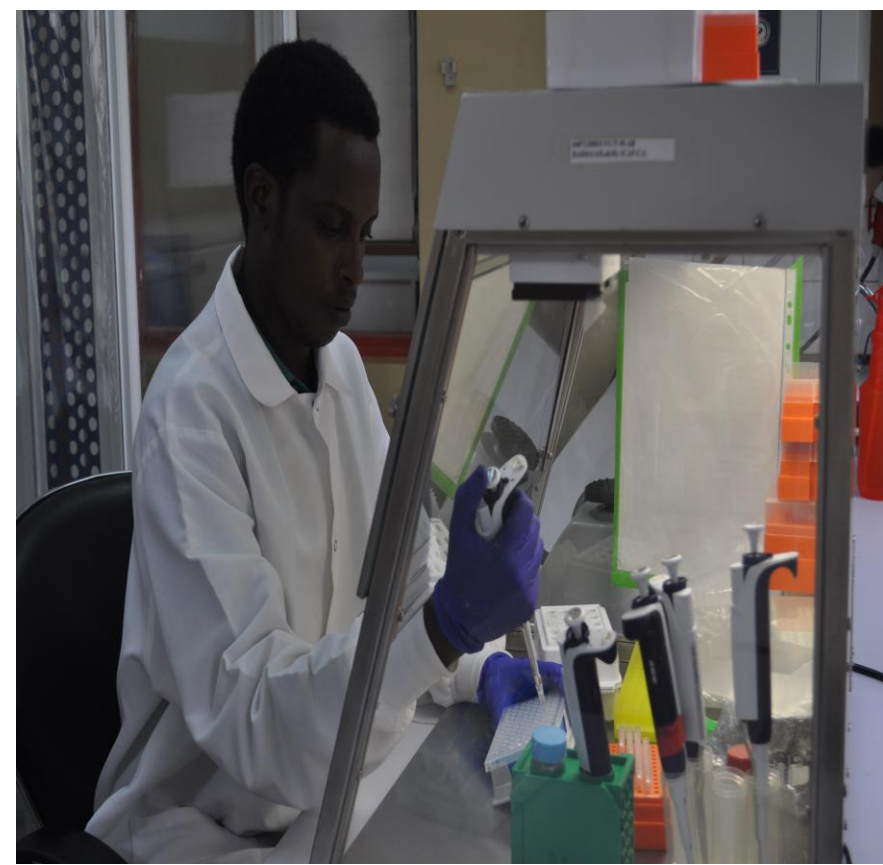


Histopathology and Skeleton Project



Leading the Scientific Community:

Molecular diagnostics and Research in wildlife health_Gorilla
& other wildlife

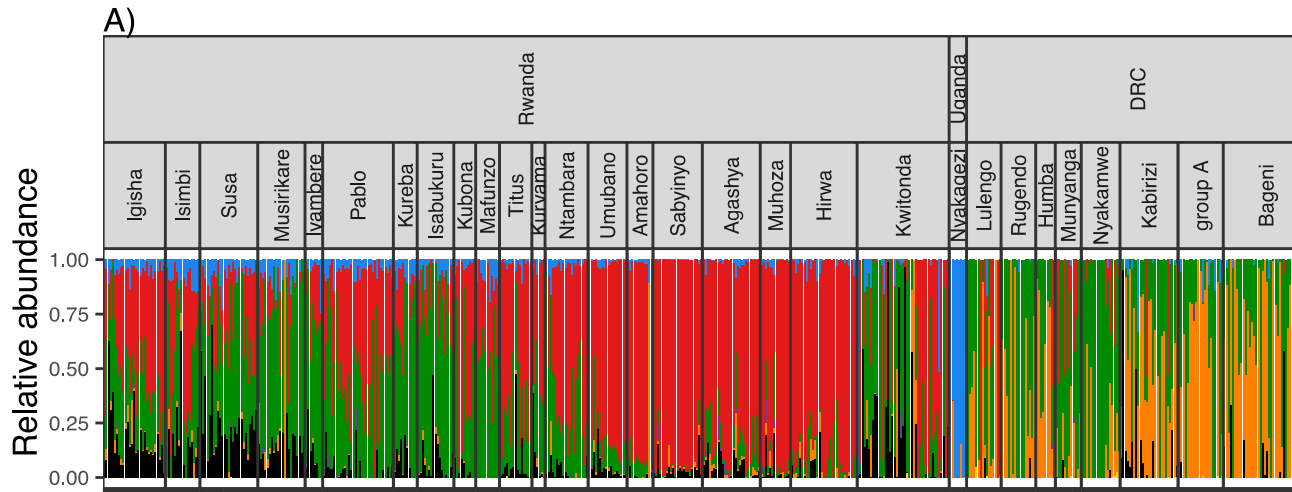


Capacity Building: Next Gen



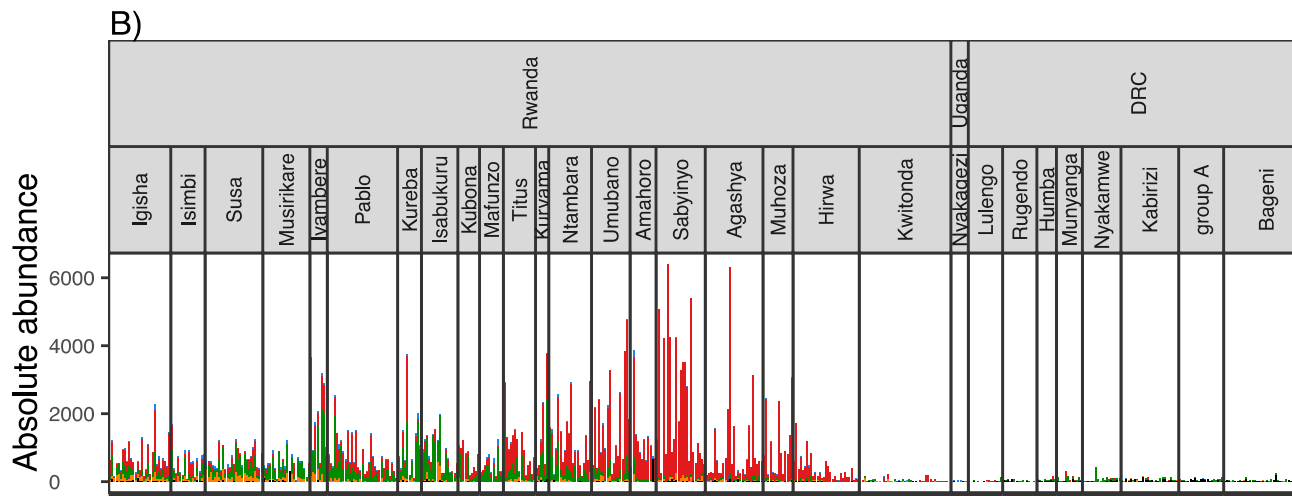
Grand Research Topics: Parasites Studies _Results

Partnership: University of Veterinary Sciences, Brno.



PUBLICATIONS

1. Heterogeneity in patterns of helminth infections across populations of mountain gorillas (*Gorilla beringei beringei*)



2. Other publications coming...

■ Impalaila ■ Hyostrongylus ■ Paralibyostrongylus ■ Strongylida.unas
■ Murshidia ■ Oesophagostomum ■ Trichostrongylus

Grand Research Topics: Fecal Virome Studies ongoing

PhD title: PATHOGEN GENOMIC ANALYSES AT THE PRIMATE-HUMAN-DOMESTIC ANIMAL INTERFACE IN RWANDA: DIVERSITY , TRANSMISSION DYNAMICS AND RESISTOME STATUS

My Supervisors team:

Dr. Roman Biek, Dr. Daniel Streicker, Dr. Willie Weir, Dr. Dan Haydon

SBOHVM ; University of Glasgow.

Themes:-

1. Ecological predictors of viral communities in mountain gorillas.
2. Viral community sharing and cross-species transmission between primates (gorillas, golden monkeys, humans) and Feral Dogs.
3. Testing for spatial gradients in the microbial resistome as a metric of anthropogenic disturbance.



Promote One Health

•It's All Related







Public health interventions

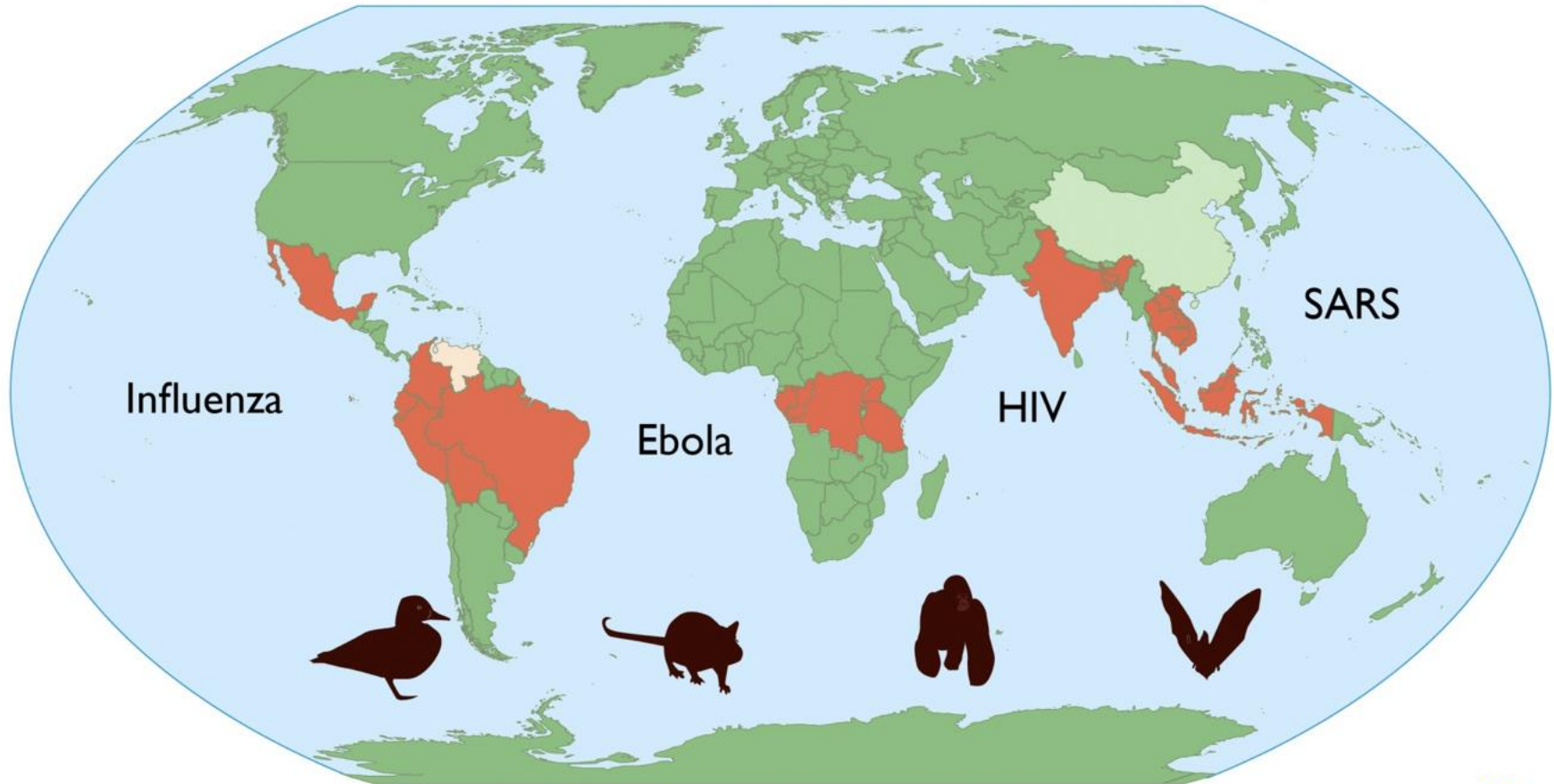


Domestic Animals

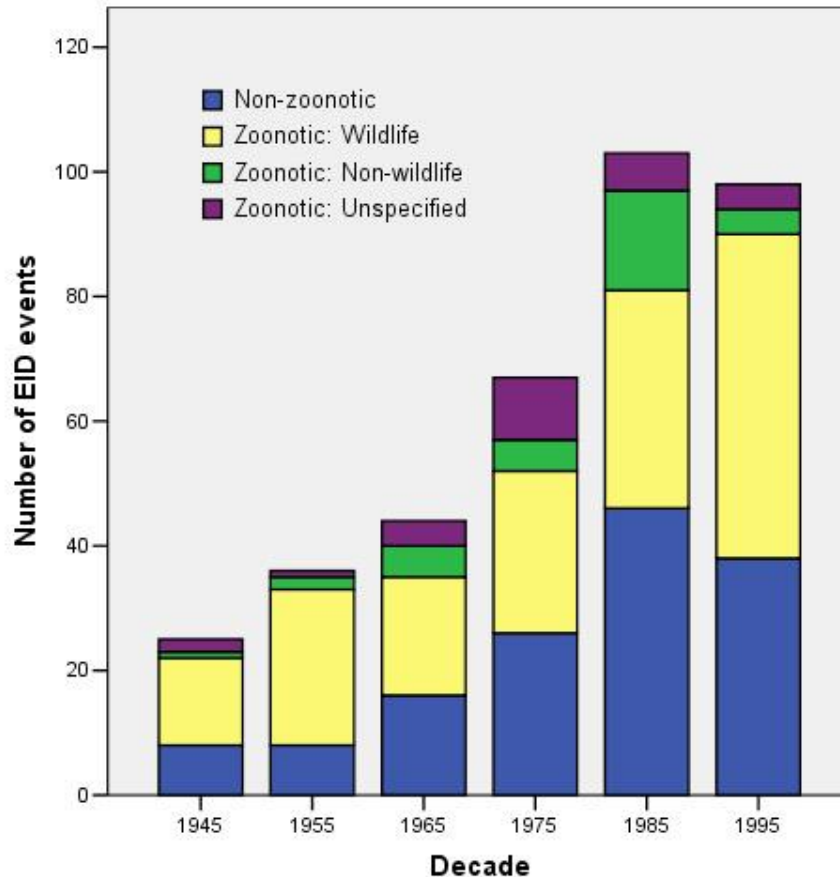


EMERGING PANDEMIC THREATS PROGRAM: PREDICT 2009-2019

PREDICT: Building a global early warning system for emerging diseases that move between wildlife and people

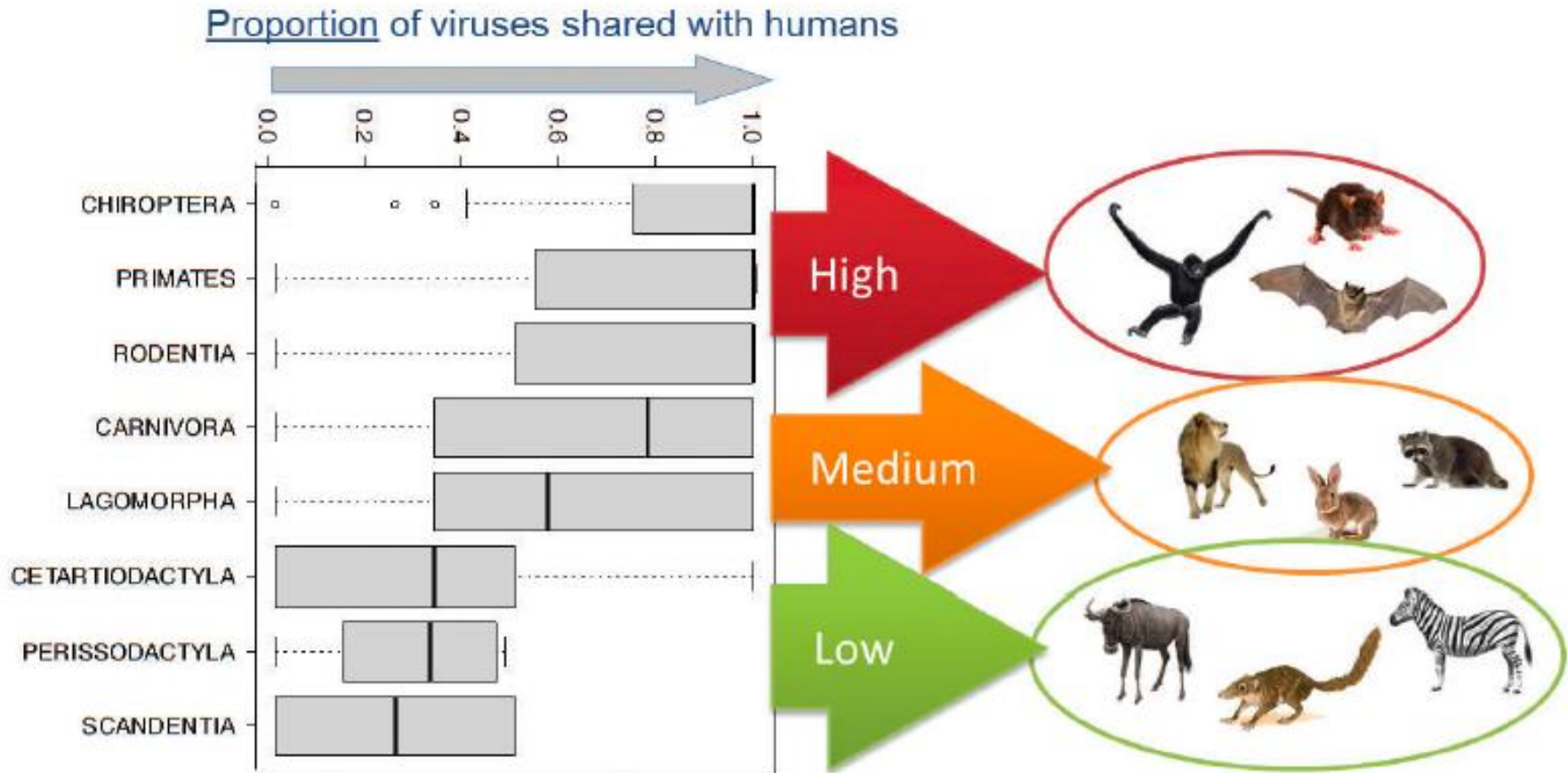


Where are zoonotic EIDs coming from?

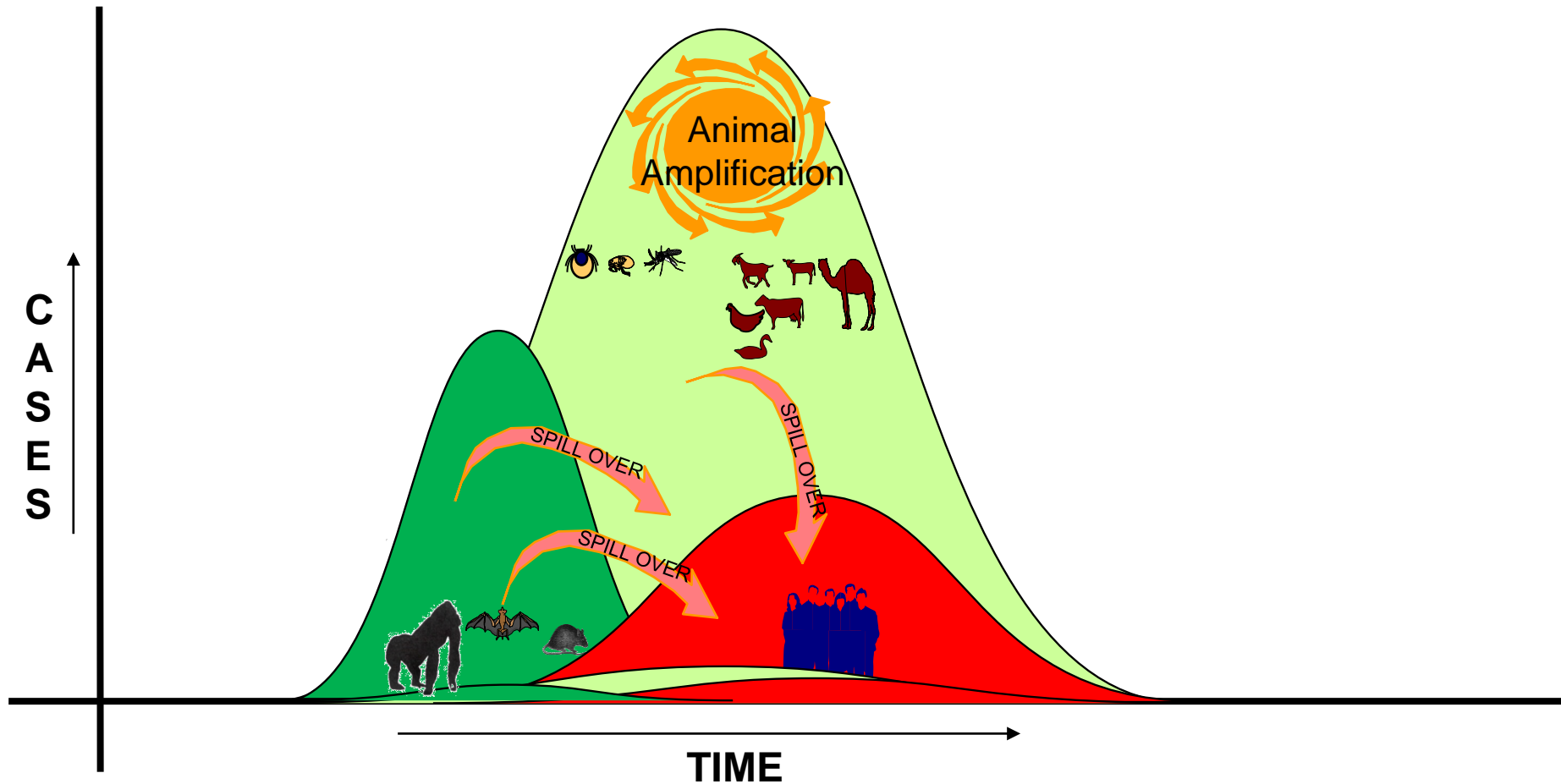


- ~5 new EIDs each year
- ~3 new Zoonoses each year
- **Zoonotic EIDs from wildlife** have reached their highest proportion in recent decades

Wildlife as sources of zoonoses



Pathogen Emergence



USAID
FROM THE AMERICAN PEOPLE

UCDAVIS
VETERINARY MEDICINE
One Health Institute



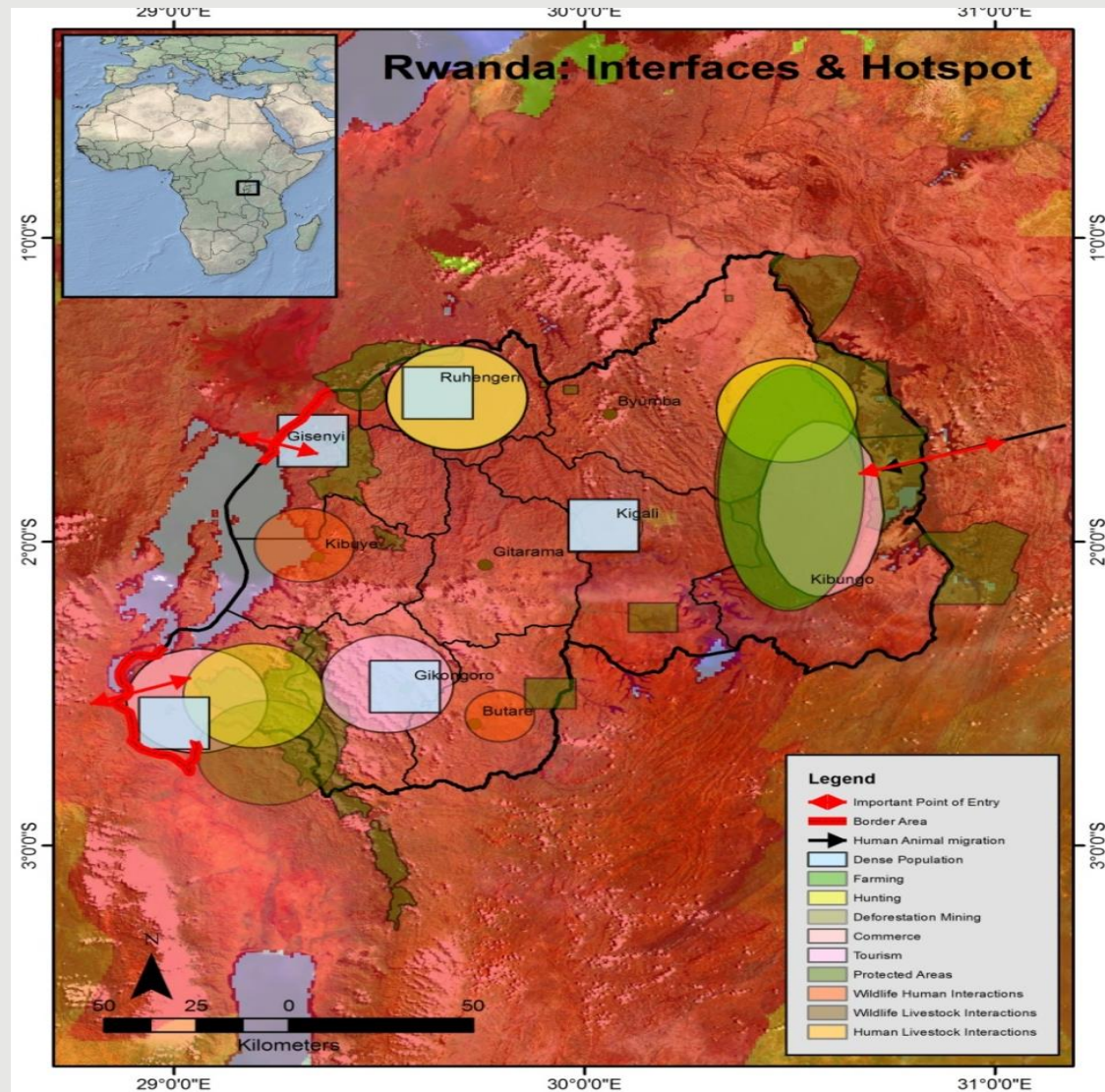
METABIOTA



RWANDA PREDICT PROJECT

2010-2019

- Independent Sites: All country provinces
- Specific areas in all provinces sampled
- **Target: HIGH** wildlife-human interfaces: Ecotourism, peridomestic wildlife, Wildlife management areas etc



Risk-based Surveillance Strategy: High-risk taxa and human-wildlife interfaces



PREDICT Project Scientific Strategy

Virology

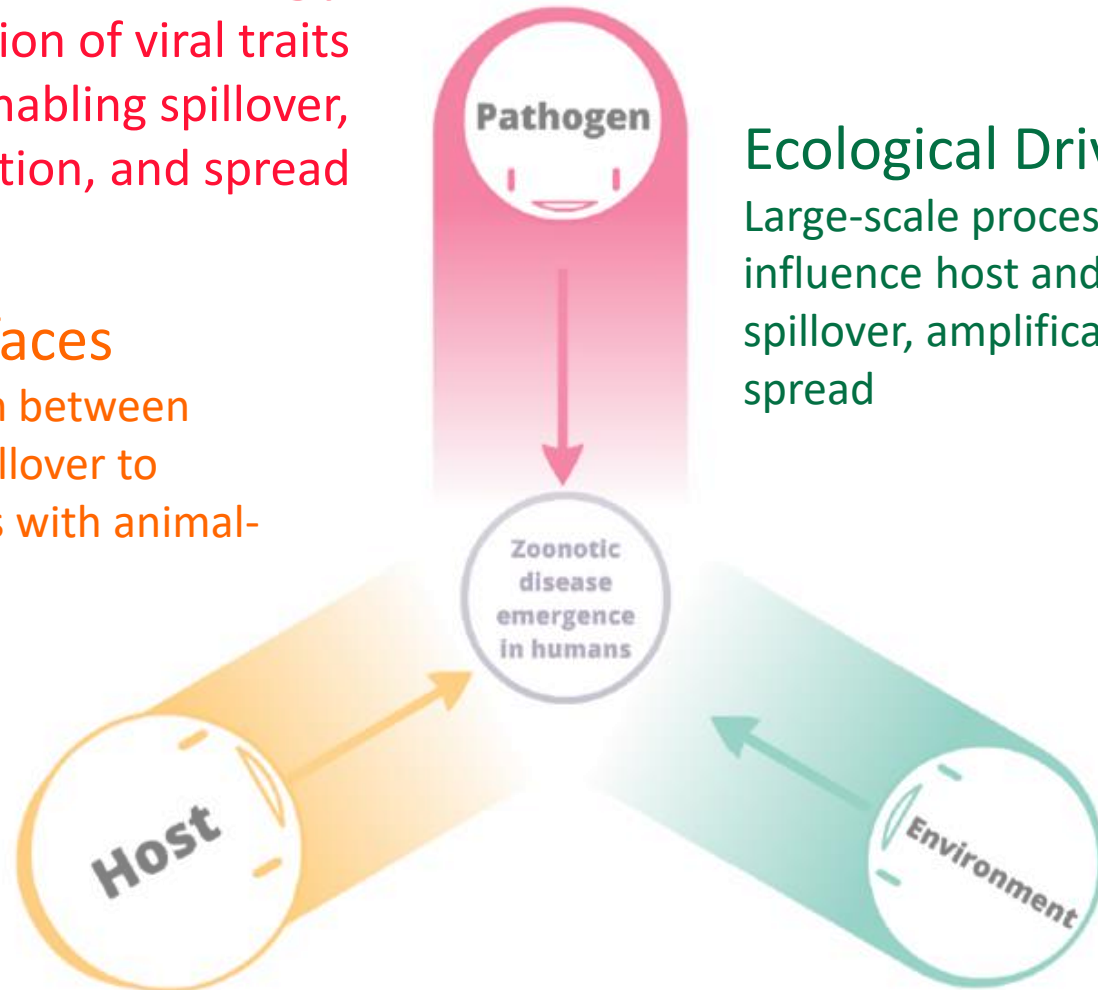
Evolution of viral traits enabling spillover, amplification, and spread

High-Risk Interfaces

Disease transmission between animal hosts and spillover to humans in situations with animal-human contact

Ecological Drivers

Large-scale processes that influence host and viral ecology, spillover, amplification, and spread



Surveillance Results

PREDICT Surveillance and Testing -

	Animals sampled	Samples collected	Animals tested	Samples tested	Tests performed
Total	2,624	14,211	2,624	5,221	19,925*

Taxa	# Animals Sampled & Humans
Bats	1099
Non-human Primates	776
Rodents & Shrews	711
Other Taxa	38
Febrile illness Patients	400
Total	3024

* Multiple Protocols

Laboratory Testing

Hosts and Priority Pathogens – PREDICT

Animal Host	Priority Pathogens
i. High Priority Species	
Rodents	Arena, Hanta, Pox, Alpha, Reo,
Bats	Flavi, Corona, Henipa, Hendra, Rhabdo, Arena, Filo, Reo
Non-human Primates	Retro, Filo, Flavi, Orthomyxo, Paramyxo, Pox, Herpes B, Corona, Arena,

Viral Testing & Discovery

- Oral Swab
- Rectal Swab or Feces
- Urine sample
- Blood Sample



- Conventional PCR – Viral Family testing



- Sequencing



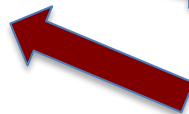
- Interpretation



- Report to Authorities
- Approval of Results



- Analysis and Modeling



- Guidance for Policy

Pathogen Discovery

- Over 5,221 samples from over 2,624 animals were tested for up to 14 viral families /genera.
- Twenty-five viruses were detected of which 14 are known and 11 are new viruses.

*Novel viruses several new adenoviruses, herpesviruses, paramyxoviruses, and coronaviruses, such as a known human Coronavirus (Human Coronavirus 229E) in a bat.

Non-malaria Febrile illness Patients Test Results

The viruses tested were from the Corona-, Filo-, Paramyxo- , Flavi and Influenza virus families.

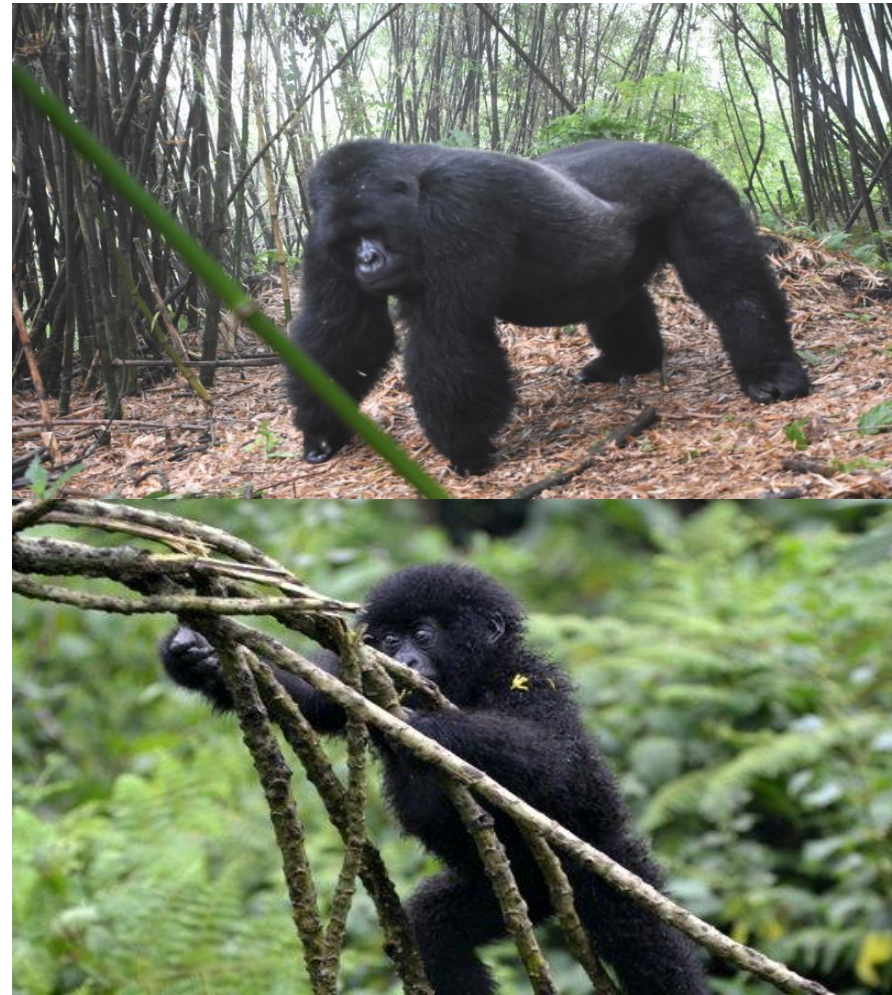
- **Administered a broad questionnaire.**
- **603 samples were tested from 400 Febrile patients**
- A strain of Human Coronavirus HKU1 in 2 people
- A strain of Human Coronavirus 229E (Human strain) in 6 patients
- Influenza B in 3 children
- Influenza A in 5 adults
- A strain of Human Parainfluenza virus 1 in 1 person
- Mumps virus in 1 person
- **All are known viruses and no new virus was discovered in the patients**

Human Metapneumovirus in Mt. Gorillas: Anthropozoonotic cases

- Identified and isolated Human metapneumovirus in Mt. Gorillas in Rwanda.

Publication:

Palacios, G., Lowenstine, L.J., Cranfield, M.R., Gilardi, K.V., Spelman, L., Lukasik-Braum, M., Kinani, J.F., Mudakikwa, A., Nyirakaragire, E., Bussetti, A.V. and Savji, N., 2011. Human metapneumovirus infection in wild mountain gorillas, Rwanda. *Emerging infectious diseases*, 17(4), p.711.



Highlights of findings

SARS-like virus identified in RWANDA

Coronavirus PREDICT_CoV-43, was detected in *Hipposideros ruber* and *R. clivosus* bats co-roosting in bat tourism caves in Musanze.

Coronavirus PREDICT_CoV-43 clustered near the SARS-like coronaviruses showing 84% nucleotide similarity to SARS-CoV.

Nziza, Julius, et al. "Coronaviruses detected in bats in close contact with humans in Rwanda." *Ecohealth* 17 (2020): 152-159.



Threats and challenges

Opportunities for emergence of pathogens:

Thriving wildlife ecotourism industry that brings people into very close contact with animals which presents a high zoonotic disease risk



Insecurity and lawlessness: DRC

- Direct mortality to gorillas
- Non- monitoring and no health interventions
- Poaching etc.



Evidence of climate change in Rwanda: *Natural calamities*





GORILLA DOCTORS STRATEGIC SCIENCE PLAN 2023- 2028

***Goal #1: Advance
evidence-based clinical
knowledge to achieve
best-possible medicine
for eastern gorillas in
the wild***



GORILLA DOCTORS STRATEGIC SCIENCE PLAN 2023- 2028

***Goal #2: Lead surveillance
and investigational research
on infectious pathogens
impacting or threatening
eastern gorilla health***

**GORILLA DOCTORS
STRATEGIC SCIENCE
PLAN 2023- 2028**

***Goal #3: Lead
investigational
research on non-
infectious
conditions
impacting great ape
health***



GORILLA DOCTORS STRATEGIC SCIENCE PLAN 2023- 2028

*Goal # 4: Predict future
eastern gorilla health
impacts under
conditions of global
environmental change*

GORILLA DOCTORS.

A Sum Greater Than its Parts: Gorilla Conservation Partners in the Region

Gorilla Doctors is formally partnered with the following organizations:



THANK YOU.



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DOCTORS**TM

www.gorilladoctors.org

