BABOONS AS POTENTIAL VECTORS OF PATHOGEN AROUND BWINDI IMPENETRABLE NATIONAL PARK, UGANDA:
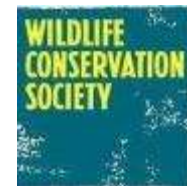
Bringing together field observations and local perceptions

Agaba Hillary Kumanya

Msc. Student ITFC/MUK

Background

- Disease-vector studies around Bwindi supported by WCS/Wild West Program under the ITFC

- The overall objective of the study is to evaluate the role of baboons as potential carriers of pathogens across the BINP park boundary among forest fauna and the contiguous human community.

- Study baboon range patterns within and between the community and the park.

Major Questions

- **How deep do baboons move in the community and the forest?**
- **When are the baboons in the community/park?**
- **How much time do they spend?**
- **Whom/what do they meet?**
- **What can/should be done?**

__Methods__

- Daily observation of two baboons troops.
  - GPS location
  - Habitat characteristics
  - Behavior/Activity
  - Measure /record distance to anthropogenic threats

- Community interviews
  - Baboon movements and distribution
  - Risk assessment
  - Strategies against raiding

Study Troops

a) Ruhija Troop

No.	Times seen
35	7
37	3
38	5
40	3

b) Buhoma Troop

No.	Times seen
27	2
28	3
30	1
32	1

Respondents

Buhoma	No. of Respondents	Ruhija	No. of Respondents
Nkwenda	6	Canteen	4
Rubona	11	Kyogo	3
Iraaro	8	Mburameizi	3
Kyumbugushu	4	Rwesanziro	8
Mukono	5	Katoma	5
Kabumba	8		
Buhoma	2		
Total	**44**		**23**

Data Analysis
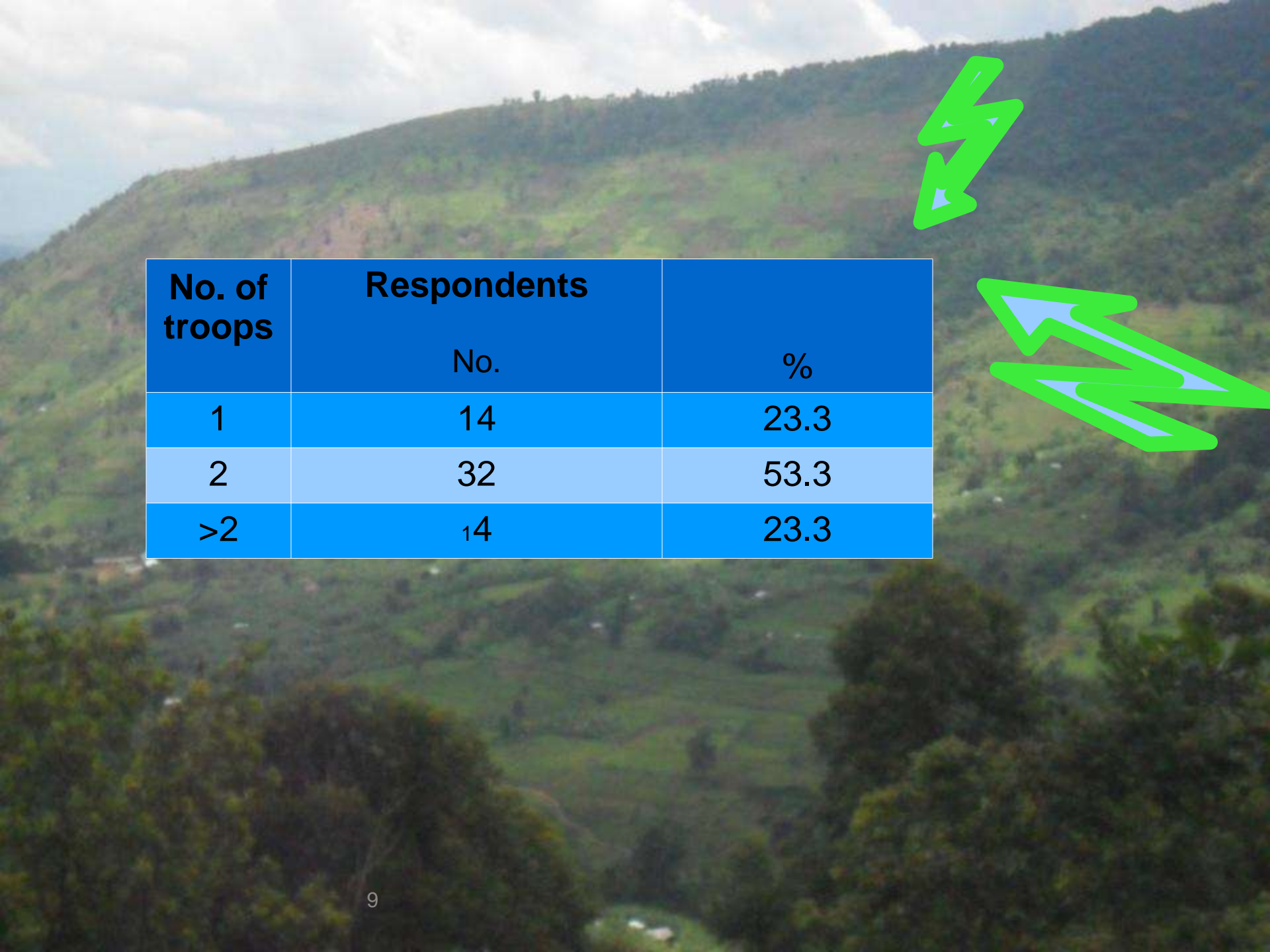
- Mapping baboon GPS location points taken with the Garmin eTrex GPS device using ArcView® 3.2 software.

- Estimating the distance from each point to the edge of the park boundary using the Nearest Features v. 3.8b (*Jenness Enterprises, Arizona*) ArcView® 3.2 extension.

- The park boundary was digitized/edge from high resolution rectified Google Earth® imagery to increase accuracy.

- The mean distance of location points observed in the field to be along the edge was calculated (Buhoma = 34.37 ± 9.00 m and Ruhija= 40.04 ± 2.06 m) to delineate edge.

- Statistical analysis was performed using SPSS with 95% Confidence Interval limits.
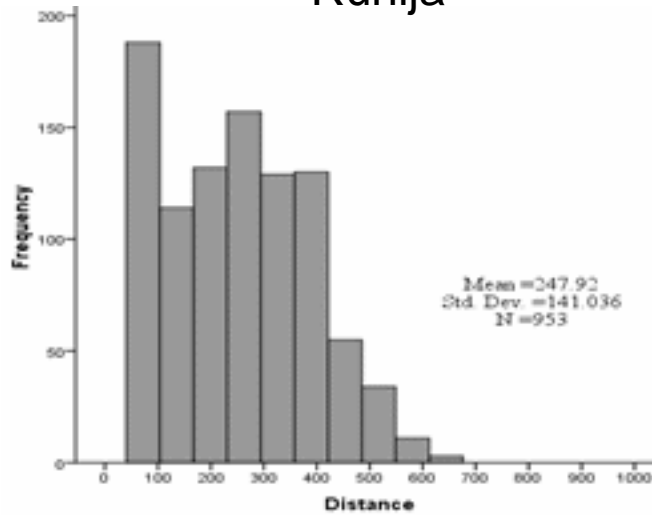
Results

Ranging pattern
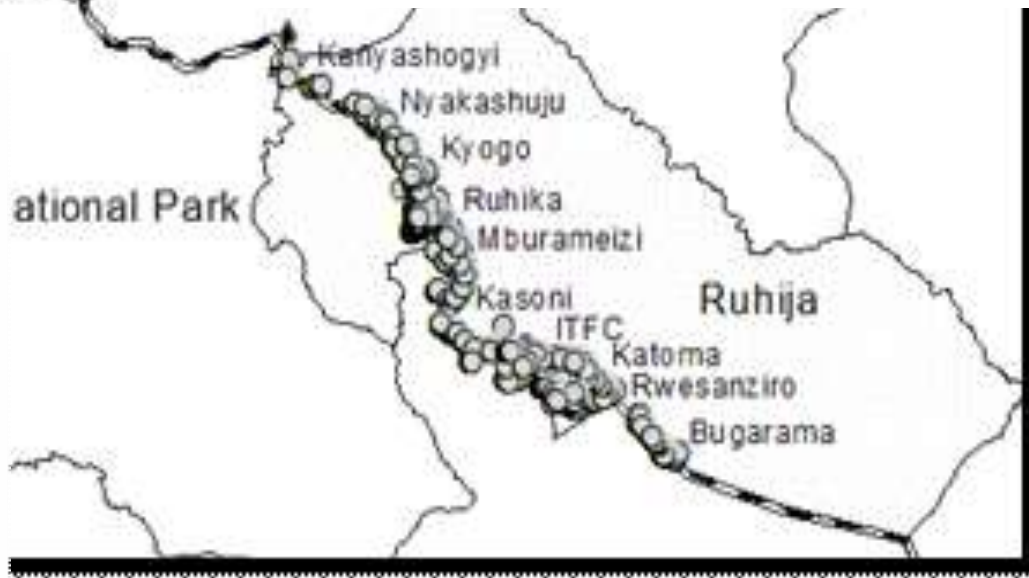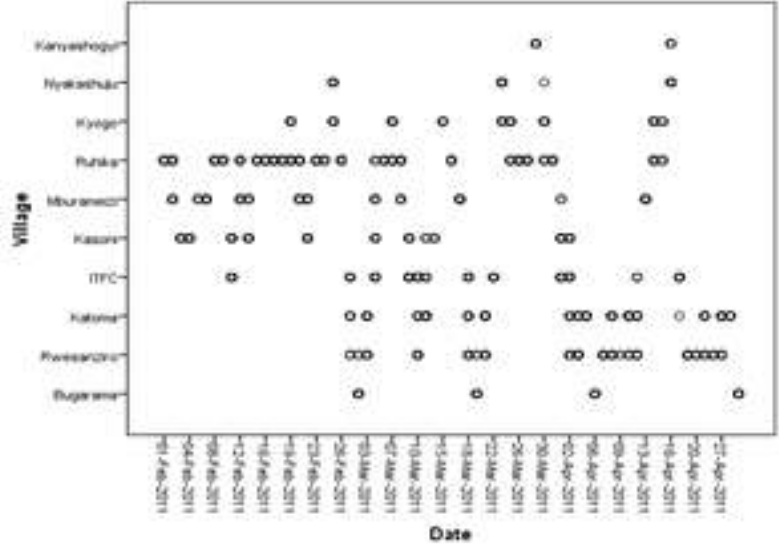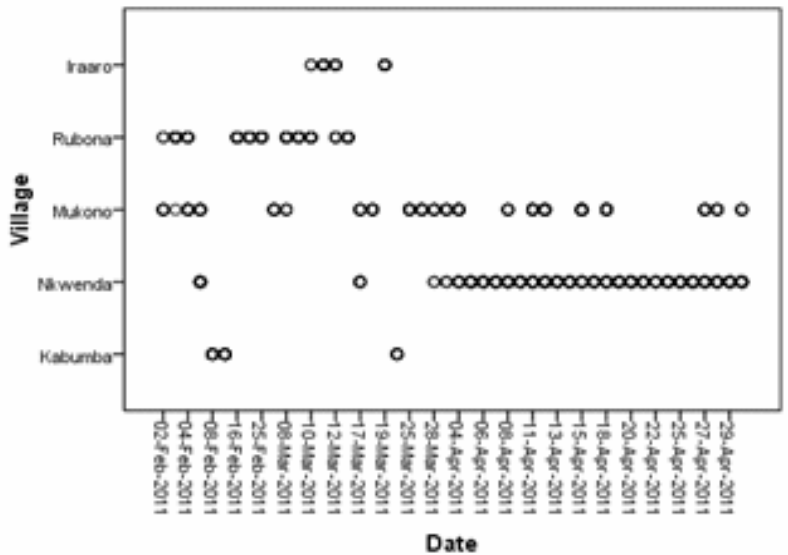
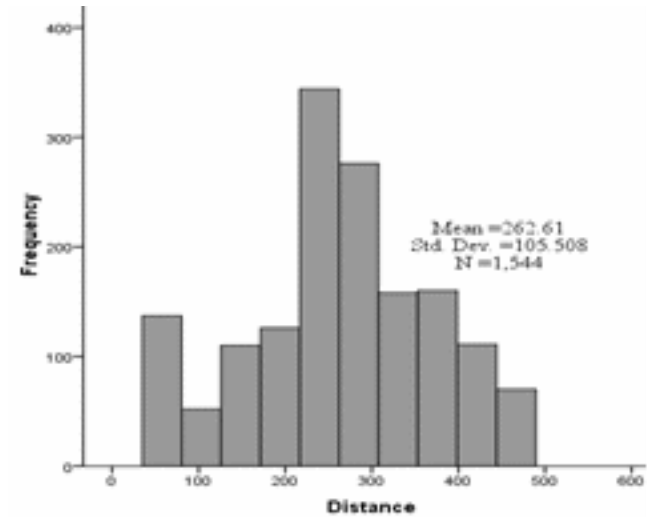| No. of troops	Respondents	
	No.	%
1	14	23.3
2	32	53.3
>2	14	23.3

Distance moved into the park/community (field data)

Ruhija — Buhoma — Park — Community
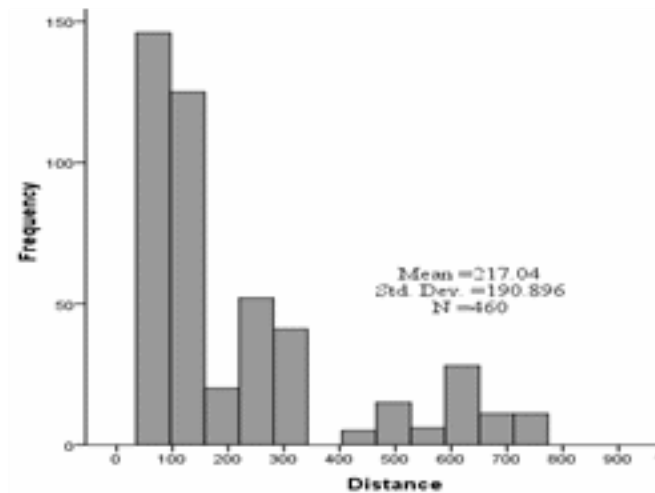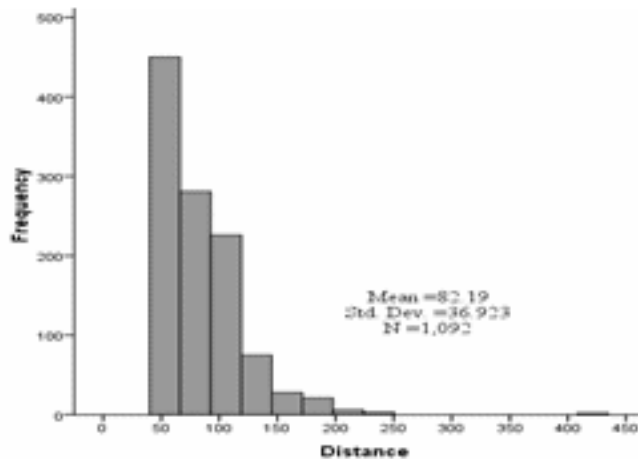
Distance into the community from respodents

Mukono Troop	Mean	95% CI	S.D.	Nkwenda	Rubona	Iraaro	Kyumbugushu	Mukono	Kabumba	Buhoma	Total N
Frequent	356.8	73.0	169.5	3	7	7	0	2	3	0	22
Moderate	383.2	70.5	78.0	0	2	1	0	0	2	0	5
Less Frequent	761.4	443.9	538.1	1	2	0	2	0	0	1	6
Never	576.2	307.6	303.8	1	0	0	2	0	0	1	4

Ruhija Troop	Mean	S. D.	95%CI	Kyogo	Mburameizi	Rwesanziro	Katooma	Total N
Frequent	484.9	307.6	215.3	2	1	4	2	9
Moderately	995.8	126.7	188.1	1	0	0	1	2
Less Frequently	263.6	.		0	0	1	0	1
Never	684.5	401.6	421.7	0	0	2	2	4

Depth according to villages

Buhoma
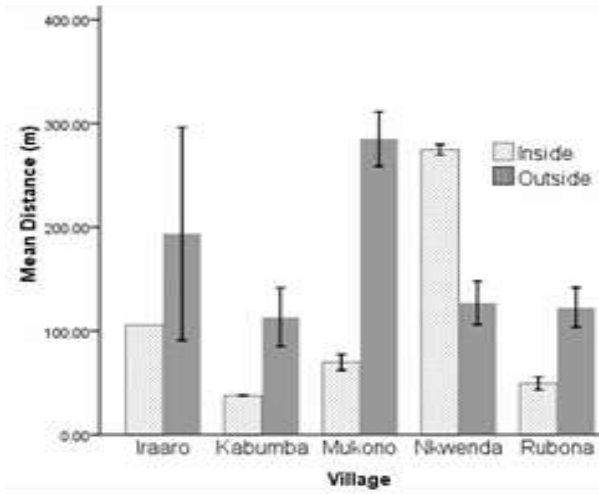
Ruhija

Field data

Distribution of time

Observed proportion of time spent by the Ruhija troop was 0.415±0.080 along the edge, 0.328±0.070 into the community, and 0.257±0.086 inside the park. The difference in time spent between the inside and edge was statistically significant (Z= 2.030, *P* = 0.042)
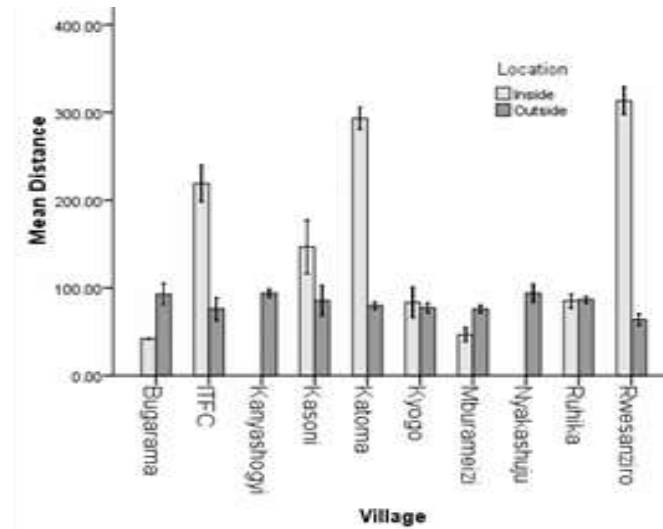
The ranking by respondents was edge (mean rank = 1.29), inside the park (mean rank = 2.29) and the community (mean rank = 2.41). The edge ranking was significant lower than both the outside of the park (Z= 2.751, *P* = 0.006) and inside of the park (Z= 2.998, *P* = 0.003).

Buhoma troop spent 0.204±0.079 along the edge, 0.454±0.123 inside the park, and 0.342±0.109 into the community. However, the differences were not statistically significant (χ^2 = 3.380, *P* = 0.185).

The park (mean rank = 1.82), edge (mean rank = 2.00) and outside (mean rank = 2.18). The difference in ranks not significant (χ^2 = 2.299, *P* = 0.317).

Temporal variation in time distribution

Field data

Location	Slope Coefficient (± 95% CI)	t-value	P-value
Buhoma (n=48 days)			
Edge	-0.002(±0.003)	-1.154	0.254
Inside	0.011(±0.003)	6.66	0
Outside	-0.010(±0.003)	-6.122	0
Ruhija (n=69 days)			
Edge	-0.004(±0.003)	-2.651	0.01
Inside	0.005(±0.003)	3.455	0.001
Outside	-0.001(±0.003)	-1.054	0.296

Respondents

a) Community
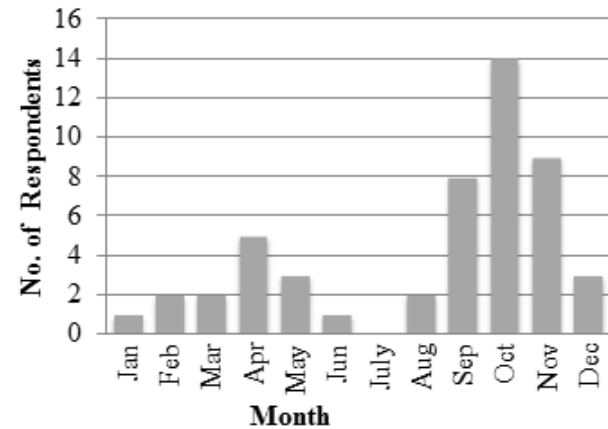
b) Park
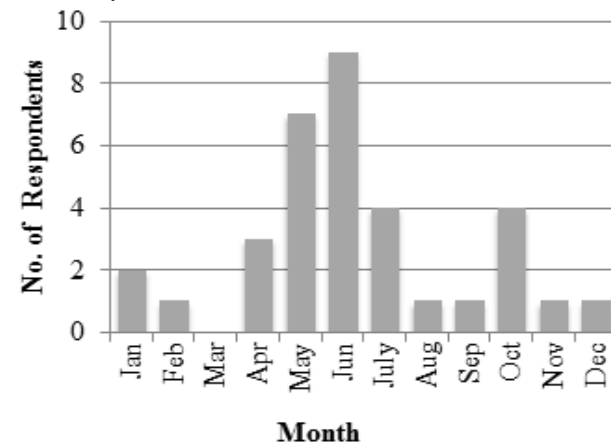
Interaction with anthropogenic threats

Respondents	Mukono (n = 40)	Ruhija (n = 19)	Total (%)
Food crop gardens	35	19	54 (91.5)
banana Plantations	11	0	11 (18.6)
Settlements	1	0	1 (1.7)
Tea plantation	1	0	1 (1.7)
Plantation forest	13	0	13 (22.0)
Bush	3	1	4 (6.8)
Storage Sites	0	1	1 (1.7)
Coffee plantation	1	0	1 (1.7)

Ruhija Field Data	Edge (%)	Outside (relative to mean distance) Within (%)	Outside (relative to mean distance) Over (%)	Overall (%)
Tea plantation	$26_{(1.9)}$	$43_{(6.7)}$	$93_{(20.4)}$	$169_{(5.0)}$
Food crops	$153_{(11.3)}$	$163_{(25.5)}$	$244_{(53.6)}$	$618_{(18.2)}$
Plantation forests	$447_{(33.0)}$	$286_{(44.8)}$	$206_{(45.3)}$	$1032_{(30.3)}$
Farm/fallow land	$31_{(2.3)}$	$9_{(1.4)}$	$26_{(5.7)}$	$82_{(2.4)}$
Settlements	$6_{(0.4)}$	$5_{(0.8)}$	$4_{(0.9)}$	$29_{(0.9)}$
Visitor lodging	$6_{(0.4)}$	$15_{(2.4)}$	$0_{(0.0)}$	$28_{(0.8)}$
Local roads	$684_{(50.4)}$	$350_{(54.9)}$	$74_{(16.3)}$	$1398_{(41.1)}$

Buhoma Field Data	Edge (%)	Outside (relative to mean distance) Within (%)	Outside (relative to mean distance) Over (%)	Overall (%)
Coffee	$0_{(0.0)}$	$4_{(1.5)}$	$59_{(28.4)}$	$63_{(2.6)}$
Tea Plantation	$42_{(11.5)}$	$24_{(9.1)}$	$23_{(11.1)}$	$95_{(4.0)}$
Bananas	$14_{(3.8)}$	$19_{(7.2)}$	$63_{(30.3)}$	$89_{(3.7)}$
Food crops	$26_{(7.1)}$	$101_{(38.3)}$	$139_{(73.5)}$	$266_{(12.2)}$
Local makeshift	$1_{(0.3)}$	$0_{(0.0)}$	$0_{(0.0)}$	$1_{(0.1)}$
Local road	$0_{(0.0)}$	$0_{(0.0)}$	$0_{(0.0)}$	$27_{(1.1)}$
Park to community water source	$4_{(1.1)}$	$0_{(0.0)}$	$0_{(0.0)}$	$12_{(0.5)}$
Tourism Trail	$1_{(0.3)}$	$0_{(0.0)}$	$0_{(0.0)}$	$217_{(9.1)}$
Within park water source	$8_{(2.2)}$			$67_{(2.8)}$

Waste Disposal During Gardening

	Food Leftovers		Human Waste	
	Number	Percent	Number	Percent
Spread	33	51.6	31	48.4
Pit	8	12.5	27	42.2
Take back home	7	10.9	-	-
No food to throw away	12	18.8	-	-
In the forest	-	-	2	3.1

Perceptions towards disease transmission according to respondents

Baboon to Human Disease Transmission	Respondent No.	Respondent %
Humans consuming baboon left overs	18	29.03
From baboon feces	9	14.52
Baboon bad body stench and dour	6	9.68
As wild animals, baboons could transmit/carry disease	7	11.29
Baboon screaming and breathing near humans	4	6.45
Approaching near to baboons	3	4.84
Contamination of water sources	2	3.23
Flies from baboon wounds	2	3.23
Baboons contaminating utensils	2	3.23

48 (76.2%) of respondents

- **Baboons always coming closer into the community**
- **Large population of baboons**
- **Transmission by biting insects**
- **Lack of medical surveillance**
- **Indirectly causing malnutrition**
- **Infecting livestock that feed closely to baboons.**

	Respondents Number	Respondents Percentage
Baboons come in contact with sick people e.g. respiratory diseases	6	31.58
Bad hygiene and sanitation and poor disposal of waste food, household and human waste	9	47.37
Poisoning baboons	1	5.26
Insect bites	1	5.26
Flies	1	5.26

20 (31.7%) of respondents

General observations

- Overall range by a troop is substantial
- Local land use patterns along the forest edge have influence on how baboons utilize range utilization
- Infrastructure (roads/accommodation) inside the park tends to increase baboons access to deeper areas of the park. These areas are also used by gorillas.
- Weather patterns influence agriculture
- Persons within 200 m to the park have a higher risk of transmitting/acquiring pathogens because the troops never go deep into the park.
- Wildlife that ranges near the boundary (old world monkeys and some habituated mountain gorillas) are at higher risk

Recommendations

- Routine health assessments, health education and sensitization to people at least within 200 m to the park

    - Good Hygiene and Sanitation
    - Not to get close to baboons/other wildlife
    - The dangers of eating baboon left overs
    - Insect nets should be emphasized

- Integrated and routine long-term pathogen surveillance of several primate species.
- Guarding
- Control baboons ?????????

Acknowledgment

- ITFC Staff and partners
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- CTPH
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