THE ROLE OF RODENTS AS RESERVOIRS OF ZOONOTIC PATHOGENS ALONG BWINDI IMPENETRABLE NATIONAL PARK BOUNDARY

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Back ground

- More than 70% of emerging infectious diseases implicate vectors and reservoirs in their transmission cycle

- Rodents (42% of mammals) have been pointed out as reservoirs of zoonotic agents e.g. fleas vector *Y. pestis*

- Rodents' success in parasite transmission is due to their flexible ecology

- This ecological flexibility makes them better hosts for parasites

Back ground cont.

- Majority of the parasites are pathogens of important socio-economic diseases in humans & wildlife
- People around the park also supplement their existence with forest resources

- This results into maximum interaction among rodents, the forest wildlife and humans

Problem statement

- Veterinary & public health importance of rodents has received insufficient attention
- Domestic species have been most studied but little is known about the wild species
- Therefore the biodiversity and prevalence of parasites on rodents needs to be investigated
- Rodents' reservoir and vector potentials also need to be evaluated

Objectives

- **Main objective**

To investigate the role of rodents as reservoirs of zoonotic pathogens along the park boundary

- **Specific objectives**

- To determine the relative abundance and distribution patterns of rodent species

- To determine the biodiversity and prevalence of parasites hosted by the rodents

Research questions & significance

Research questions

- What are the distribution and species specific habitat utilisation patterns of the rodents
- What is the prevalence of ecto and endo parasites among the rodents

Significance of study

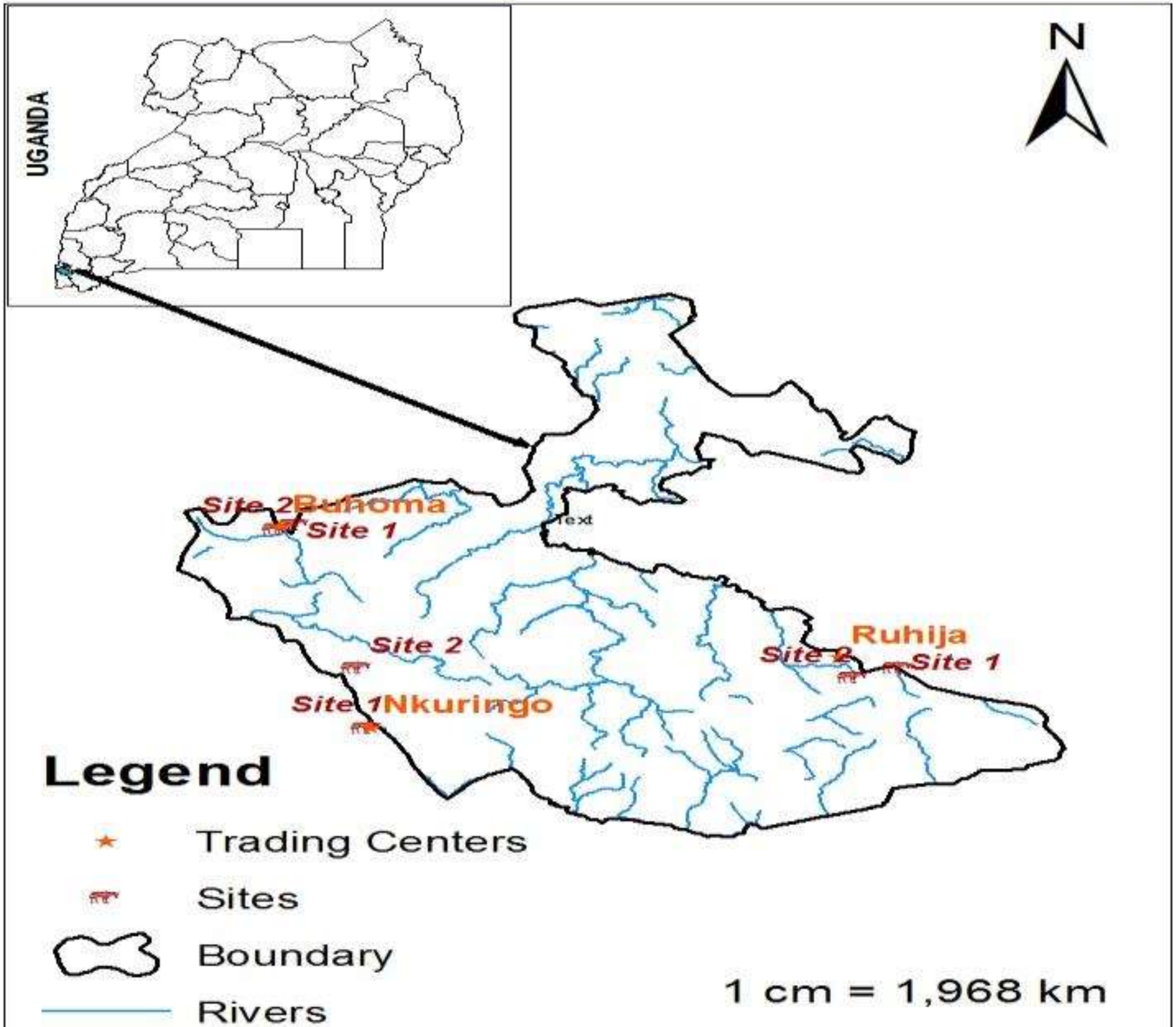
- Ecological data will be a basis for designing an ecosystem health approach to prevention of zoonoses
- Study will provide data on potential zoonotic parasites on rodents and common associated pathogens

Methods & materials

Study area

- Bwindi I. N. P
  - Ruhija, Buhoma and Nkuringo.
- Bwindi is a world heritage site with human population of 300/sq km
- Approx half of mountain gorillas in the whole world live here

RODENT COLLECTION SITES ALONG BWINDI NATIONAL PARK BOUNDARY



Methods and materials cont

Trapping of rodents

Traps: Sharman & Tomahawk live traps

Bait:

combination of maize flour, roasted powdered ground nuts, fish and sweet potatoes

Methods & materials cont

- A trap web (4 transects,200m @, 80 trap stations, 120 traps) was set at park boundary
- Two trap webs were set per study area
- Traps were inspected for 6 days and then 4 after an extension of 2 transects by 200 m
- For each area, 1920 trap nights
- Traps were baited once in the evening & inspected in the morning & evening of the following day

Materials & methods cont

Rodent processing

- Rodents captured were identified, weighed, sexed, brushed to collect ectoparasites and their fecal collected
- Rodents were marked by toe clipping & released at the point of capture
- The GPS & dominant vegetation around the trap stations was recorded

Methods & materials cont.

Laboratory processing

- Ectoparasites were depigmented, dehydrated, cleared, & mounted in DPX for identification

- Faecal samples were concentrated using formal-ether concentration techniques & examined for endoparasites

- Pathogen prevalence was determined for each species

Data analysis

Abundance & distribution

- Relative abundance, Shannon diversity index & species evenness were calculated

Ecological characteristics

- Whittaker plots were used to find out the model of species abundance adapted by the rodents
- Community coefficients were calculated to determine the degree of habitat similarity

Pathogen prevalence

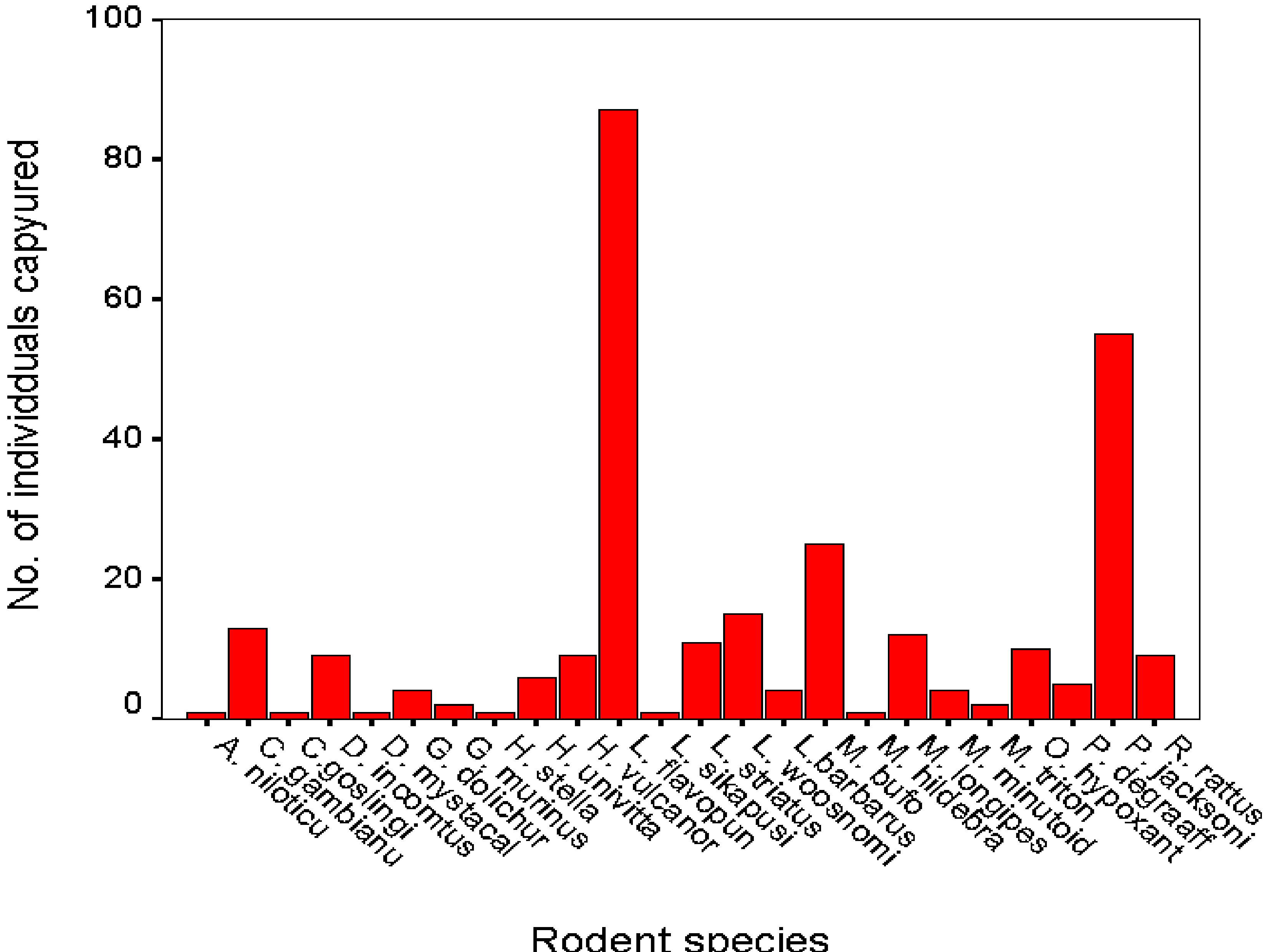
- Parasite prevalence & host preference were determined
- Relationship between parasite & rodent abundances were analysed using Spearman rank coefficient
- Difference in parasite abundance was tested using Kruskal wallis test

Results

Species Richness per Study Area compared with the level of Habitat Disturbance

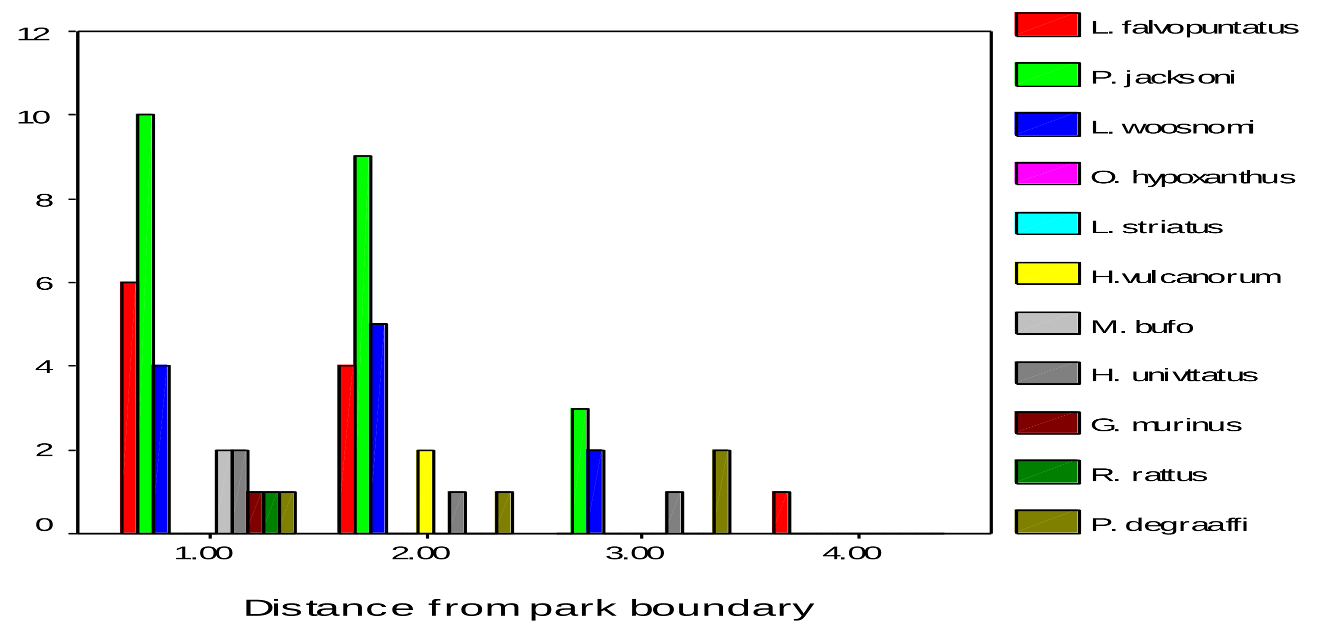
Study Area	**Species richness**	**Diversity index**	**Level of habitat disturbance**
Ruhija	11	0.73	moderate
Nkuringo	20	0.97	High
Buhoma	11	0.79	Low

Results: Diversity of Rodents

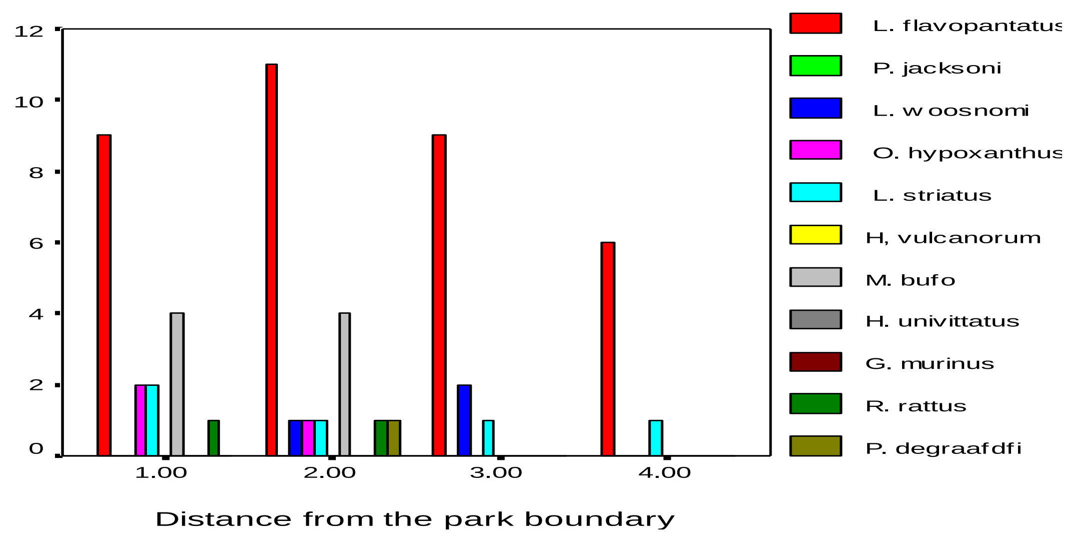


Distribution of rodent species from the park boundary

Inside the park



Out side the park



1.00-(0-29 m) 2.00-(30-59 m) 3.00-(60-89 m) 4.00-(90 m >)

Results: Ectoparasite Biodiversity

Fleas (12.1%) (9 species)	**Mites (84.6%) (5 species)**	**Ticks (0.8%) (2 species)**	**Micro snails (2.5%)**
Ctenophalides felis	*Dermanyssus gallinae*	*Haemaphysalis leachi*	Not identified
Libyastus infestus	*Echinolaelaps echidninus*	*Rhipicephalus lunulatus*	
Nesopsyllus fasciatus	*Laelaps nuttali*		
Stivalius torvus	*Haemolaelaps glasgowi*		
Ctenophthalmus cabirus	*Eulaelaps stabularis*		
Leptopsylla aethiopicus			
Xenopsylla braziliensis			
Libyastus hopkinsi			
Ctenophalides canis			

Fleas

Ctenophalides felis

Nesopsyllus fasciatus

Stivalius torvus

Libyastus infestus

Libyastus hopkinsi

Ctenophalide cains

Leptopsylla aethiopicus

Ctenophthalmus caphurus

Xenopsylla brazilliensi

Mites

Haemolaelaps glasgowi

Laelaps nuttali

Echinolaelaps echidninus

Eulaelaps atabularia

Dermanyssus gallinae

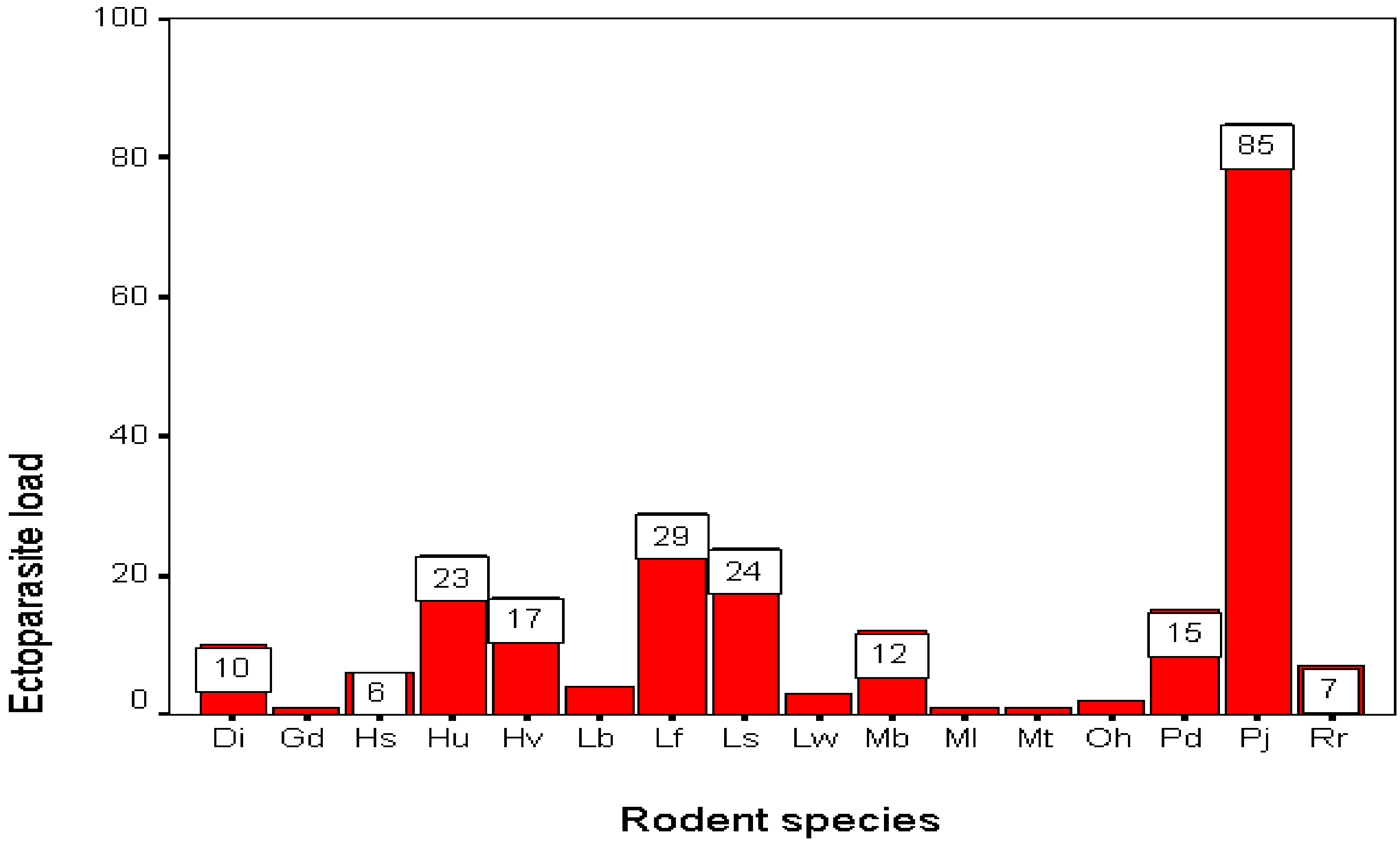
Ticks

Haemaphysalis leachi

Rhipicephalus lunulatu

Microsnail

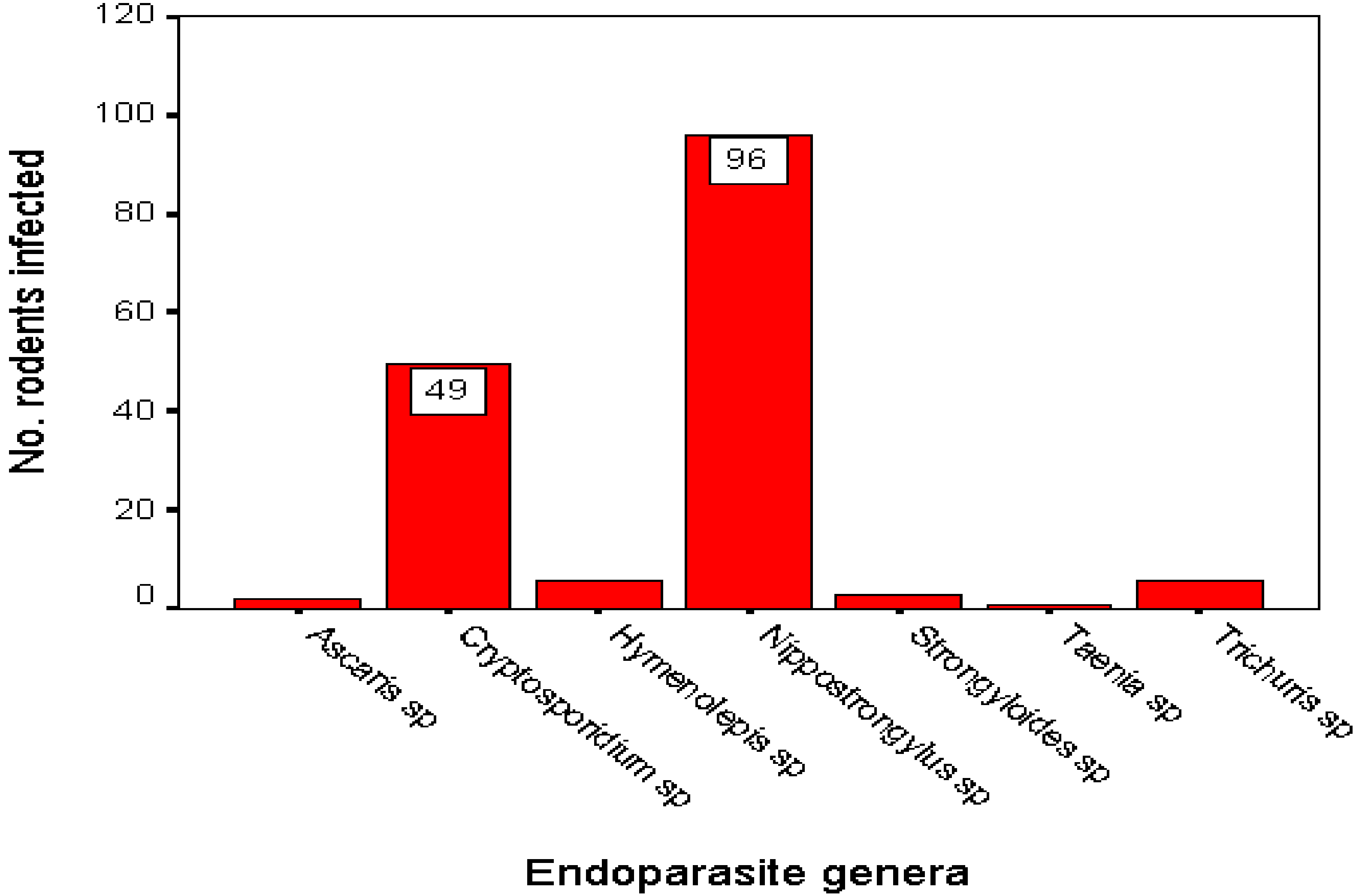
Ectoparasite load per species



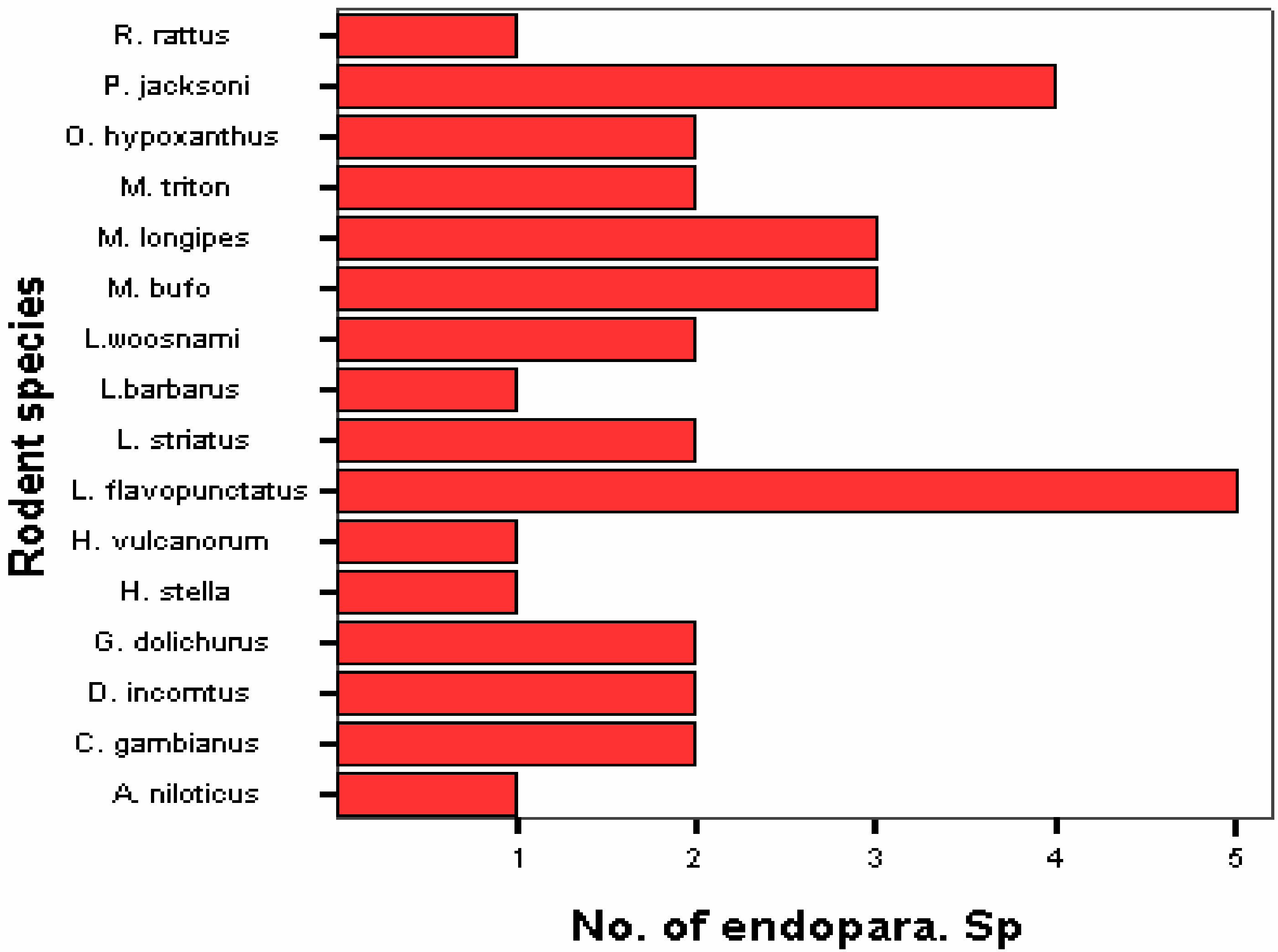
Host preference among ectoparasites using specific indexes

	Host															
Ectoparasites	*Pj*	*Hu*	*Lf*	*Rr*	*Mb*	*Mt*	*Hv*	*Lw*	*Ls*	*Lb*	*Pd*	*Oh*	*Di*	*Ml*	*Hs*	*Gd*
Ctenophalides canis	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
Ctenophalides felis	66.7	0	33.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Ctenophthalmus cabirus	0	0	25	0	0	25	0	0	50	0	0	0	0	0	0	0
Dermanyssus gallinae	58.8	0	0	0	0	0	0	0	0	0	35.3	0	5.9	0	0	0
Echinolaelaps echidninus	55.4	4.5	6.3	4.5	8.9	0	8	0	0	0	6.3	0	0	0	5.4	0.9
Eulaelaps stabularis	0	0	20	0	0	0	0	0	80	0	0	0	0	0	0	0
Haemaphysalis leachi	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haemolaelaps glasgowi	0	62.5	12.5	0	0	0	0	0	25	0	0	0	0	0	0	0
Laelaps nuttali	8.2	14.8	19.7	0	3.3	0	9.8	0	24.6	4.9	1.6	3.3	9.8	0	0	0
Libyastus hopkinsi	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Libyastus infestus	16.7	16.7	16.7	0	0	0	33.3	16.7	0	0	0	0	0	0	0	0
Leptopsylla aethiopicus	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Microscopic snail	33.3	0	33.3	0	0	0	0	0	0	0	0	0	33.3	0	0	0
Nesopsyllus fasciatus	25	0	50	0	0	0	0	0	0	0	0	0	0	25	0	0
Rhipicephalus lunulatus	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
Stivalius torvus	14.3	28.6	14.3	14	0	0	0	14.3	0	0	14.3	0	0	0	0	0
Xenopsylla braziliensi	0	0	0	50	0	0	0	0	0	0	0	0	50	0	0	0

Endoparasite Biodiversity



No. of endoparasite species per rodent species



Zoonotic Significance of the Parasites

Parasite	**Zoonotic agent**	**Disease caused**
Mites		
L. echidninus &	*Yersinia pestis*	Plague
L.nuttalli	*Coxiella burnetti*	Q. fever
	Orienatal tsutsugamushi	Scrub typhus
	Leptospira interrogan	Leptospirosis
D. gallinae	Encephalitis viruses	Encephalitis

H. glosgowi	Lymphocytic choriomeningitis virus	Lymphocytic choriomeningitis
	Coxiella burnetti	Q. fever
	Rickettsia sibirica	North Asian tick Typhus
	Francisella tularensis	Tularemia
	Hantaan virus	Epidemic Haemorrhagic Fever

Fleas		
X. braziliese,	*Yersinia pestis*	Plague
C. felis & *C. canis*	Yersinia pestis	Plague
Ticks		
H. leechi	*Rickettsia canorii*	Typhus
Endoparasites		
Cryptosporidium		Cryptosporidiosis
Hymenolepis		Intestinal damages

Conclusions & Recommendations

- Rodents host a wide range of zoonotic pathogens
- Single infections are more common than mixed
- Proliferation of rodent populations are enhanced by environmental and socio-economic factors
- Park managers should integrated comprehensive & participatory rodent control strategies in management plans e.g. wastes management
- An investigation of the occurrence of rodent borne diseases among dwellers is needed to know the epidemiological pattern these diseases

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