Ecological correlates of wildlife diseases

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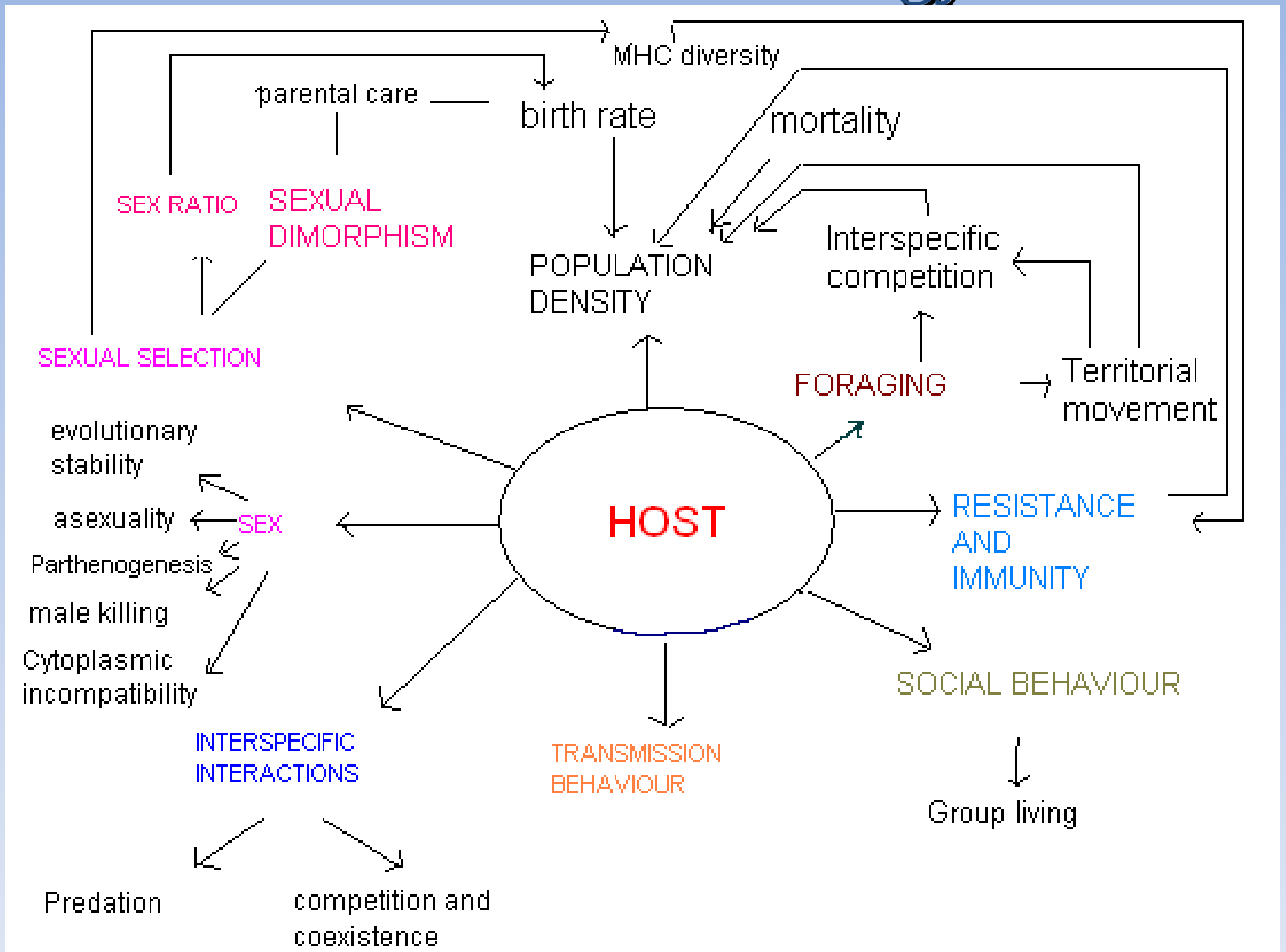
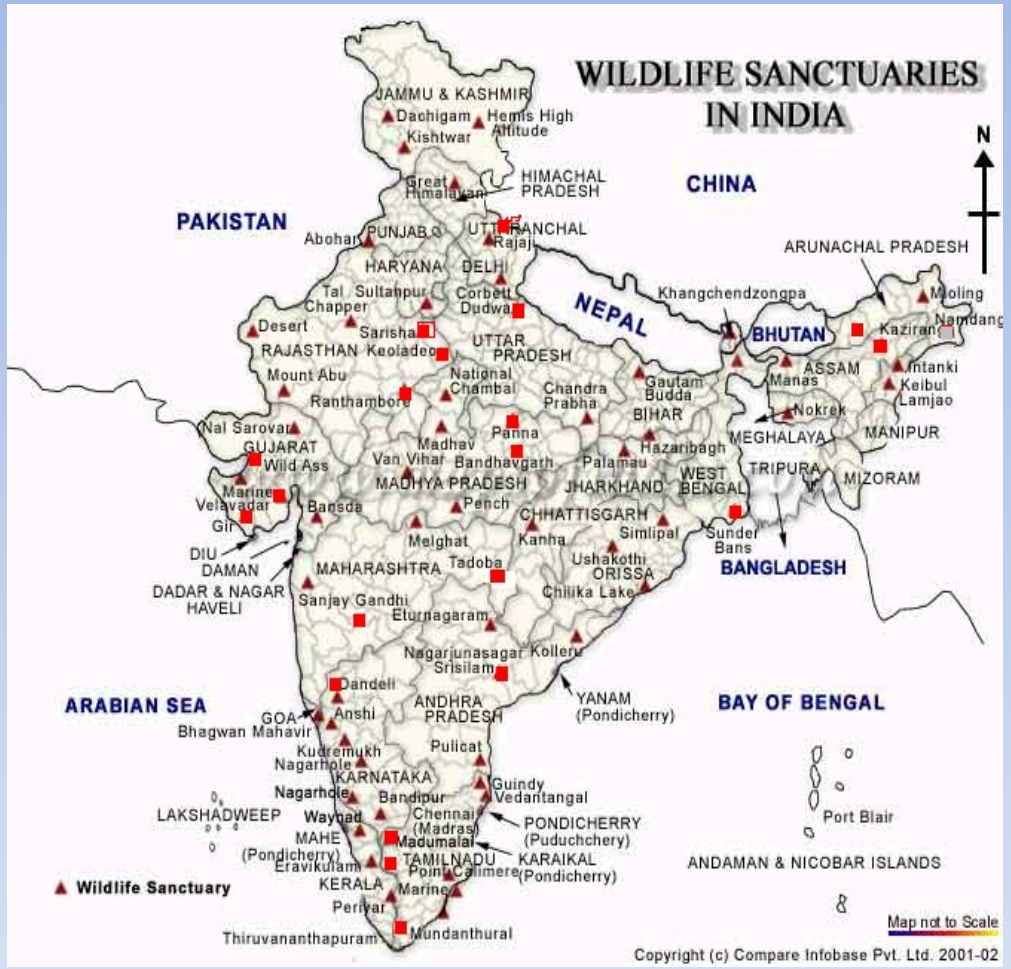
- Why study wildlife diseases?
  - Disease: an intrinsic component of natural ecosystems
  - Wildlife health and conservation
  - Potential reservoir for emerging diseases,
- Why ecological correlates?
  - conditions for endemism/epidemics
- Which diseases should we look at?
  - micro/macroparasites
  - endemic/epidemic

Parasites in host ecology



Wildlife Sanctuaries of India.



Sanctuaries visited for sample collection

What decides parasite load?

Host ecological variables potentially affecting parasite loads and diversity

- Host population density
- Host body size and home range
- Host phylogeny
- Gregariousness
- Anatomical niche diversity
- Host diet
- Predatory pressure

Four levels of analysis for testing the hypotheses

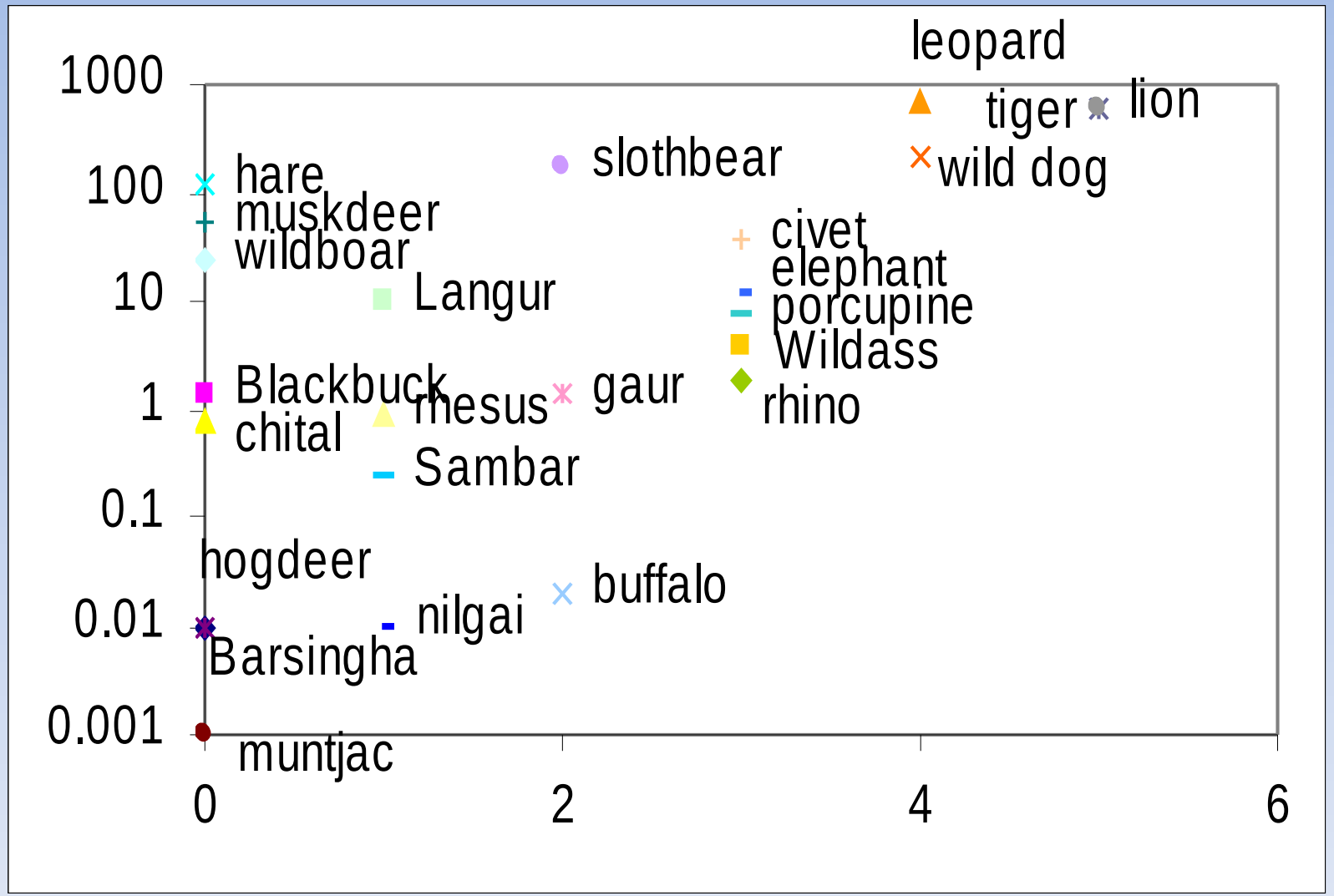
- Individual as a unit. (2551 individual samples coming from 29 species from 20 wildlife sanctuaries)
- Species as a unit. (mean or median parasite loads of 24 host species, grouped ecological variables)
- Species as a unit. (non parametric correlations with demographic data in Tadoba National Park, 9 host sp).
- Intra-specific patterns – across different habitats (2 host sp.)

Effect of host variables on parasite bads

Analysis with species as a unit Pooled data from all sanctuaries

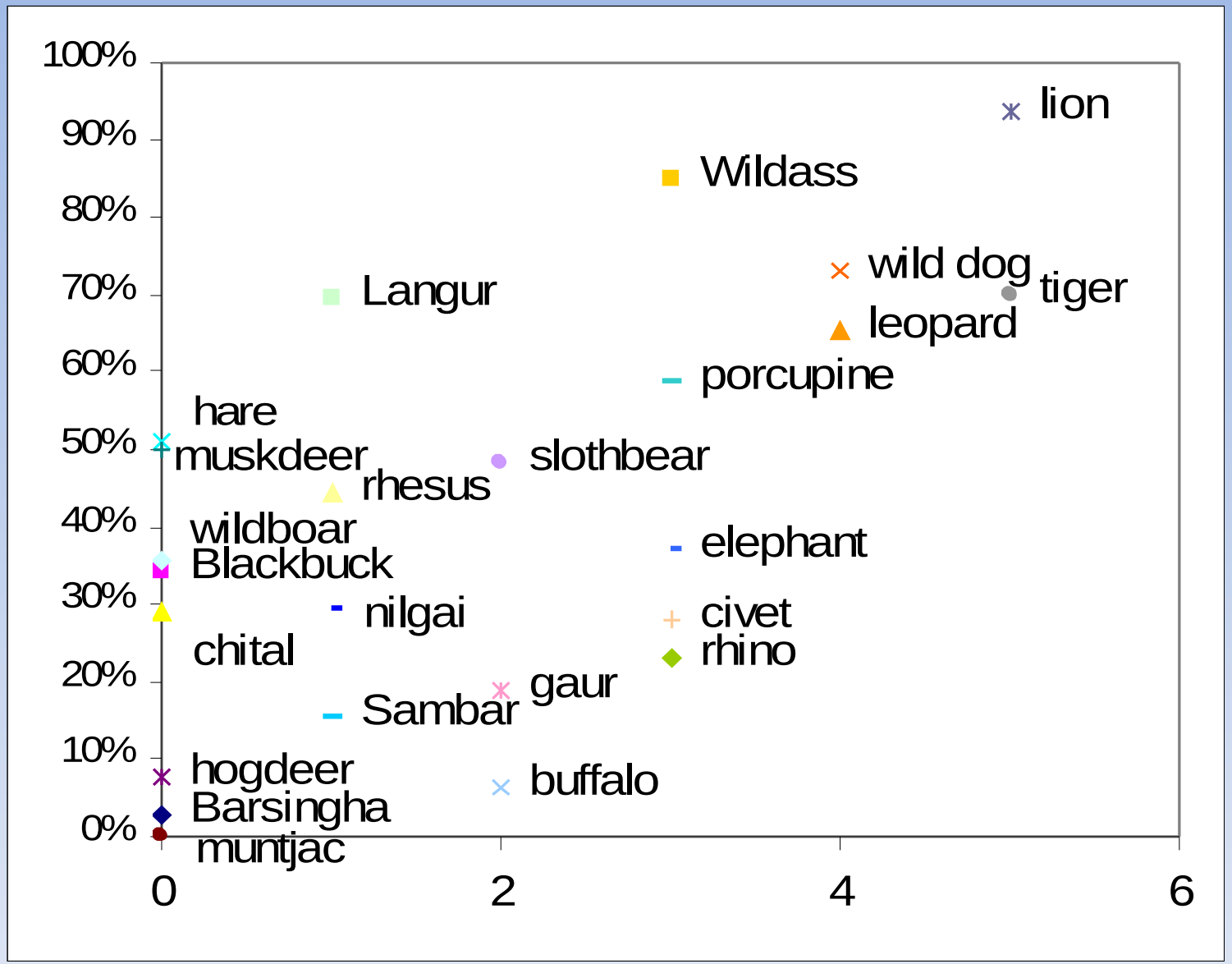
Predation freedom index Vs mean parasite load

Kendall's =0.53

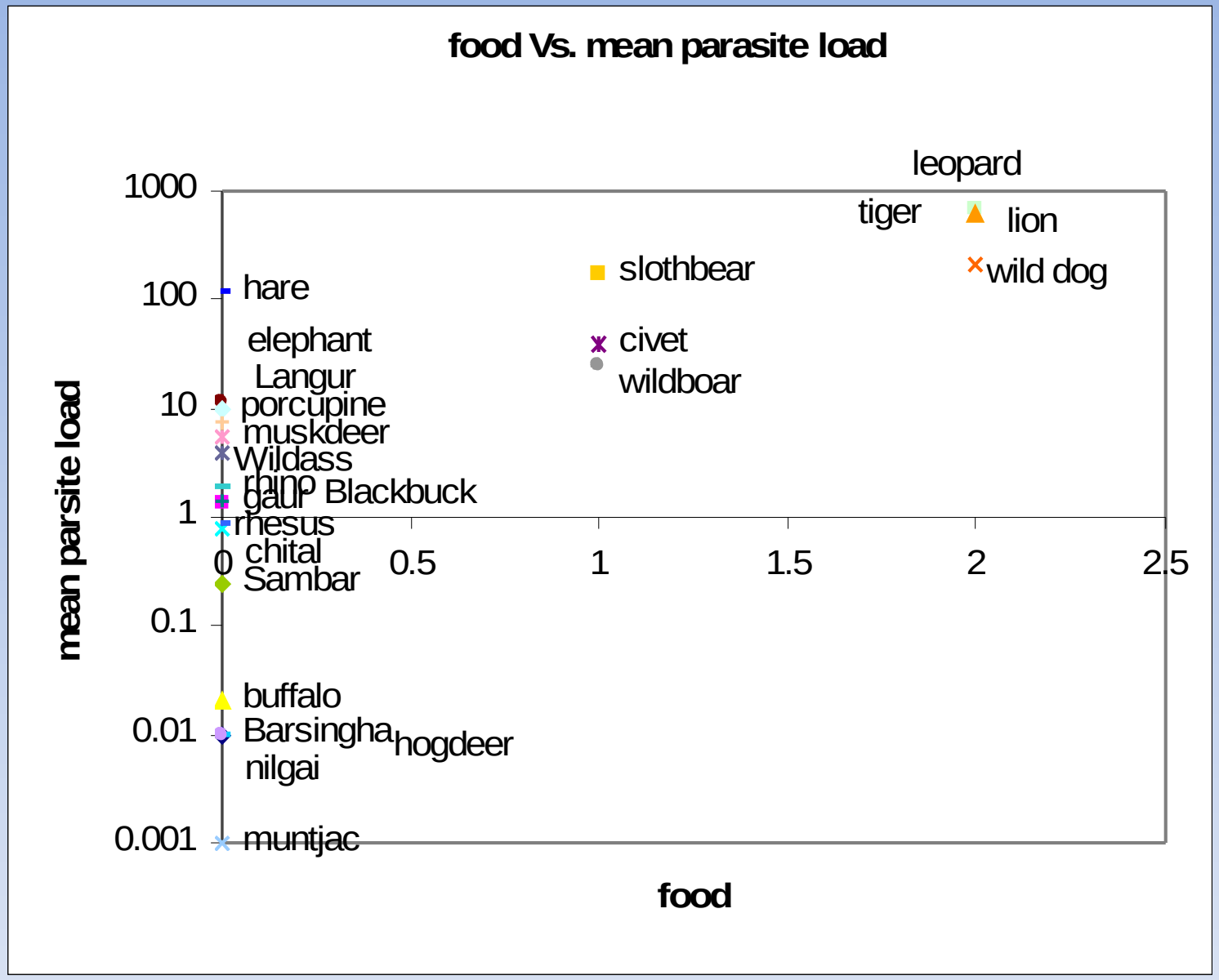


Predation freedom index Vs prevalence

Kendall's =0.4264

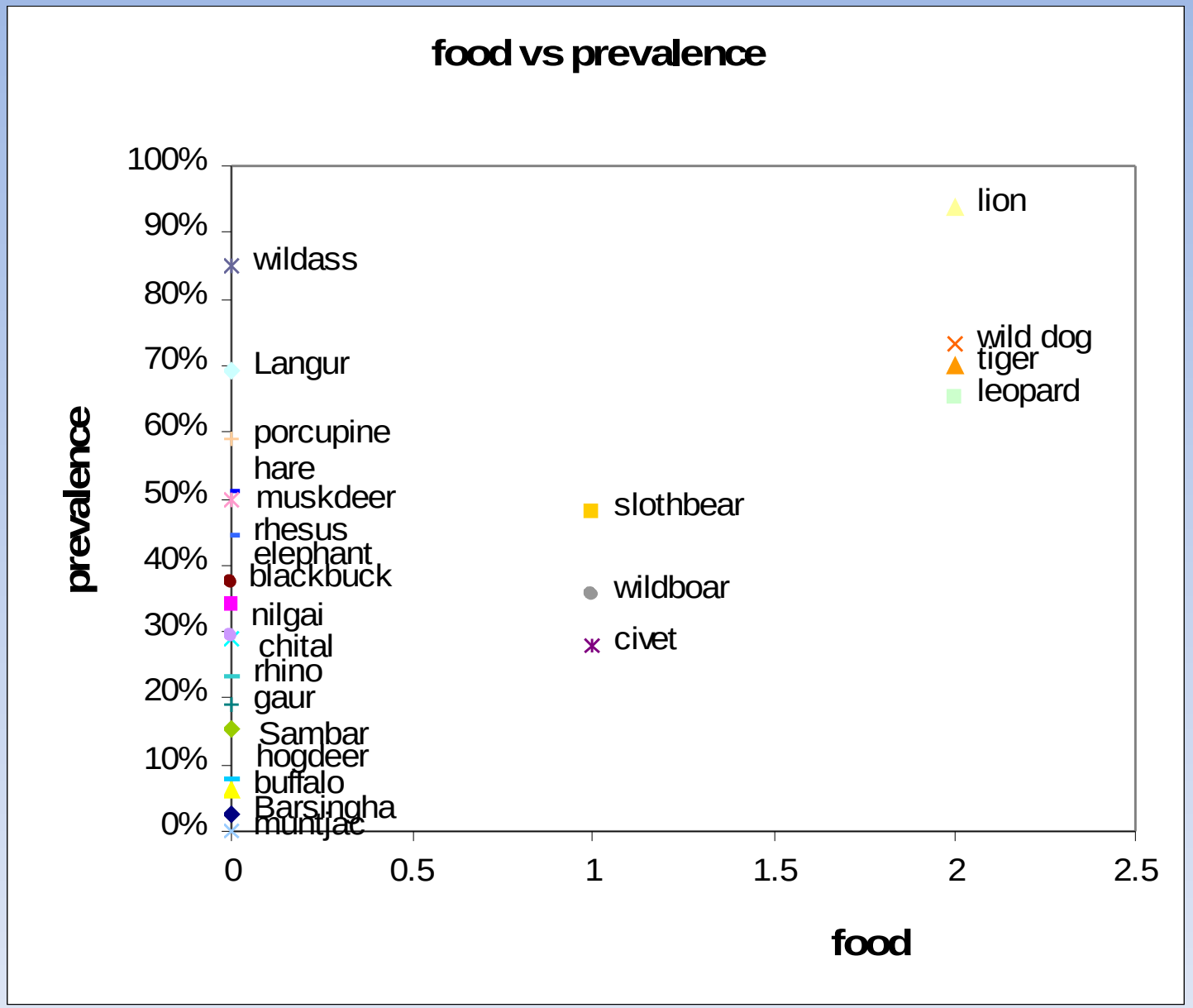


Kendall's =0.54



0= herbivore 1= omnivore 2= carnivore

Kendall's =0.33



Species as a unit.

Non parametric correlations with demographic data in Tadoba National Park.

Density	density	F:F ratio	adult sex ratio	pred index (num)	predation index (biomass)	average eggs	average proto	egg + proto
Female:fawn ratio	-0.022							
Adult Sex Ratio	-0.200	**-0.511**						
predation index (numbers)	0.452	0.181	-0.226					
predation index (biomass)	**0.542**	0.000	0.136	**0.598**				
average eggs	-0.223	-0.313	0.045	-0.432	-0.432			
average protozoa	**-0.536**	-0.268	0.089	-0.250	**-0.523**	0.292		
egg + protozoa	-0.447	-0.447	0.268	**-0.477**	-0.341	**0.562**	**0.697**	
Sex ratio in Tiger Kills	0.400	-0.400	0.200	0.600	**0.800**	0.200	0.200	0.200

Turning the question upside down

What decides the standing density of a species?

- **Birth rate** – female:fawn ratio, sex ratio

  no correlation

- **Predation rate** – predation index, sex ratio in kills

  Positive correlation contrary to expection

- **Disease, starvation, malnutrition** etc – reflected in fecal parasite counts

  Negative correlation

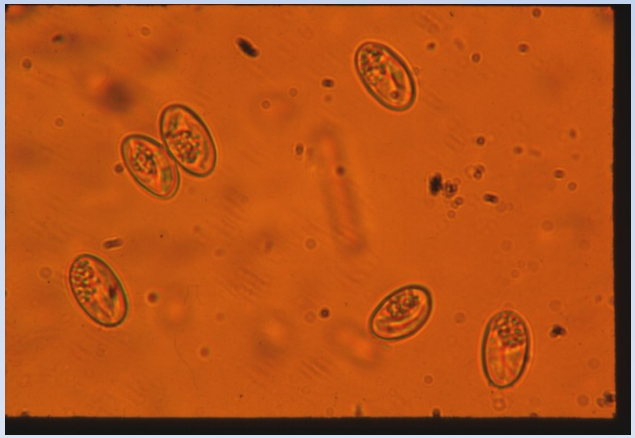
Testing predation hypothesis in Chital

Bharatpur (predator free habitat) compared with others

	Bharatpur	Sariska & Ranathambhor	
No. of observations	79	130	
Average of ranks	51.85	23.57	
	Wx =4096	Wy = 3064	U=3057
		Z=12.35	P<0.001

	Bharatpur	Other wet habitats	
No. of observations	79	243	
Av. Of ranks	70.03	43.68	
	Wx= 5533	Wy=10616	U=5533
		Z=10.05	P< 0.01

Predator – prey – parasite dynamics
Chital – Dhole- *Sarcocystis*
(Jog et al 2005)



Predation hypothesis:

ecological Vs evolutionary

- Ecological: predators remove infective individuals from the population (removal of predator should reverse the effect quickly)

- Evolutionary: prey species experience greater selection for parasite resistance.

  (removal of predator not expected to reverse the effect for several generations)

- Both effects seen, evolutionary stronger.

Possible implications

- Density regulation by diseases and parasites
- Predator regulation of diseases and parasites
- Disturbance of predator-prey dynamics may lead to unpredictable changes in parasite dynamics
- Species/populations devoid of predators need to be watched more carefully as a potential source of emerging diseases