

Integrating parasite communities into infection-diversity research

Felipe Dargent, PhD

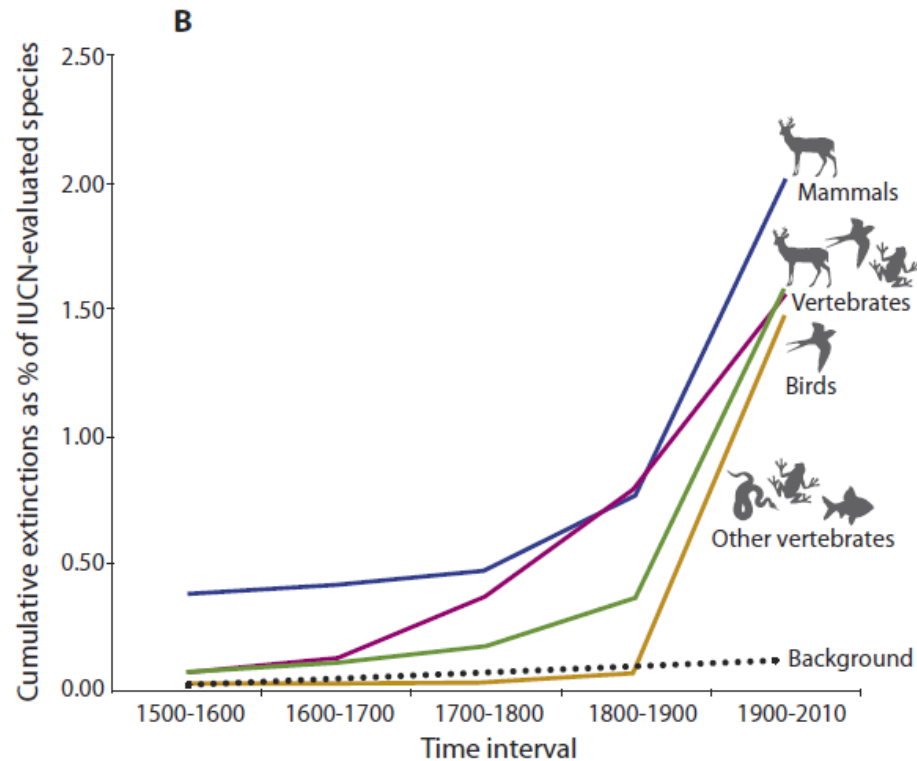
Banting Postdoctoral Fellow - NSERC

University of Ottawa

Fredericton, NB, August 20th 2019

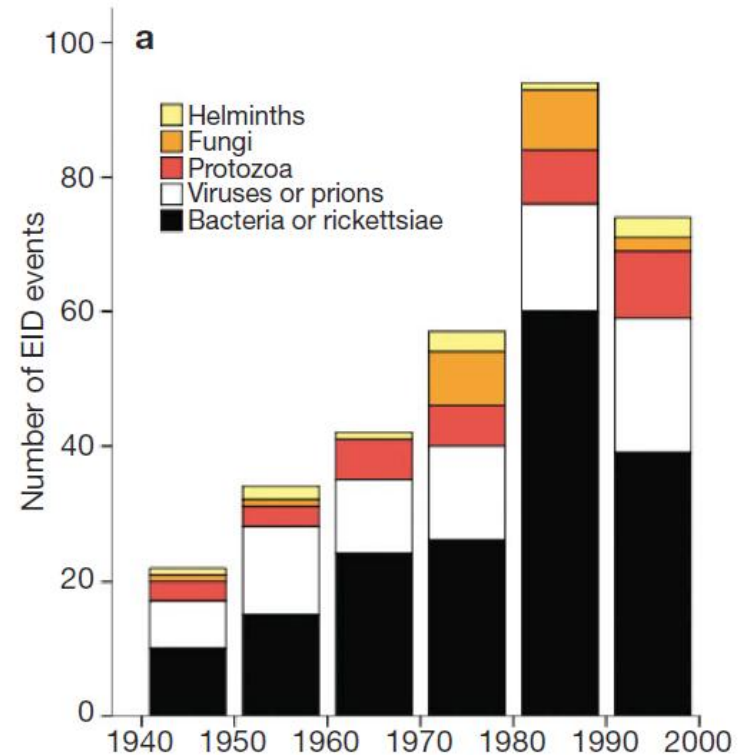
Context – Biodiversity and disease

Rate of species loss



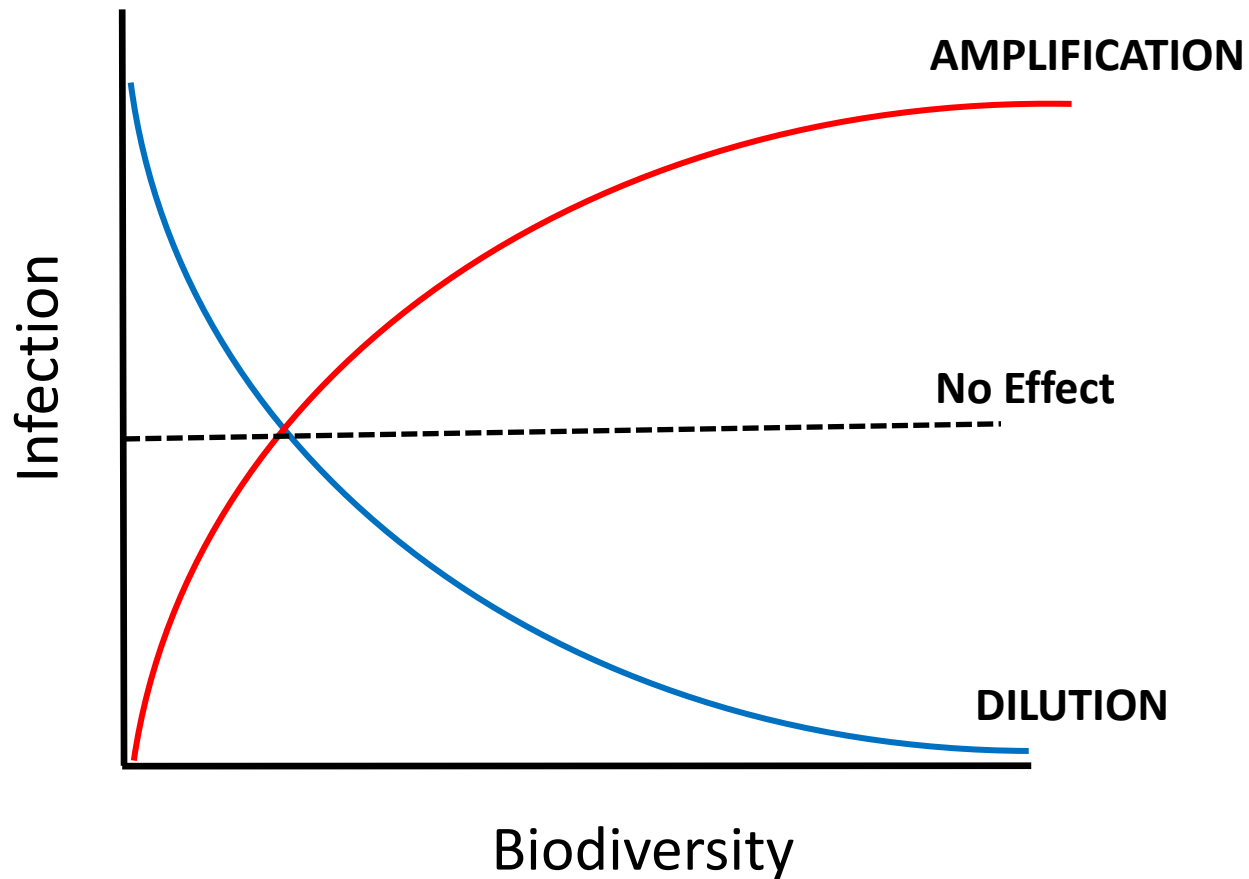
Ceballos et al. 2015

Emergent infectious diseases

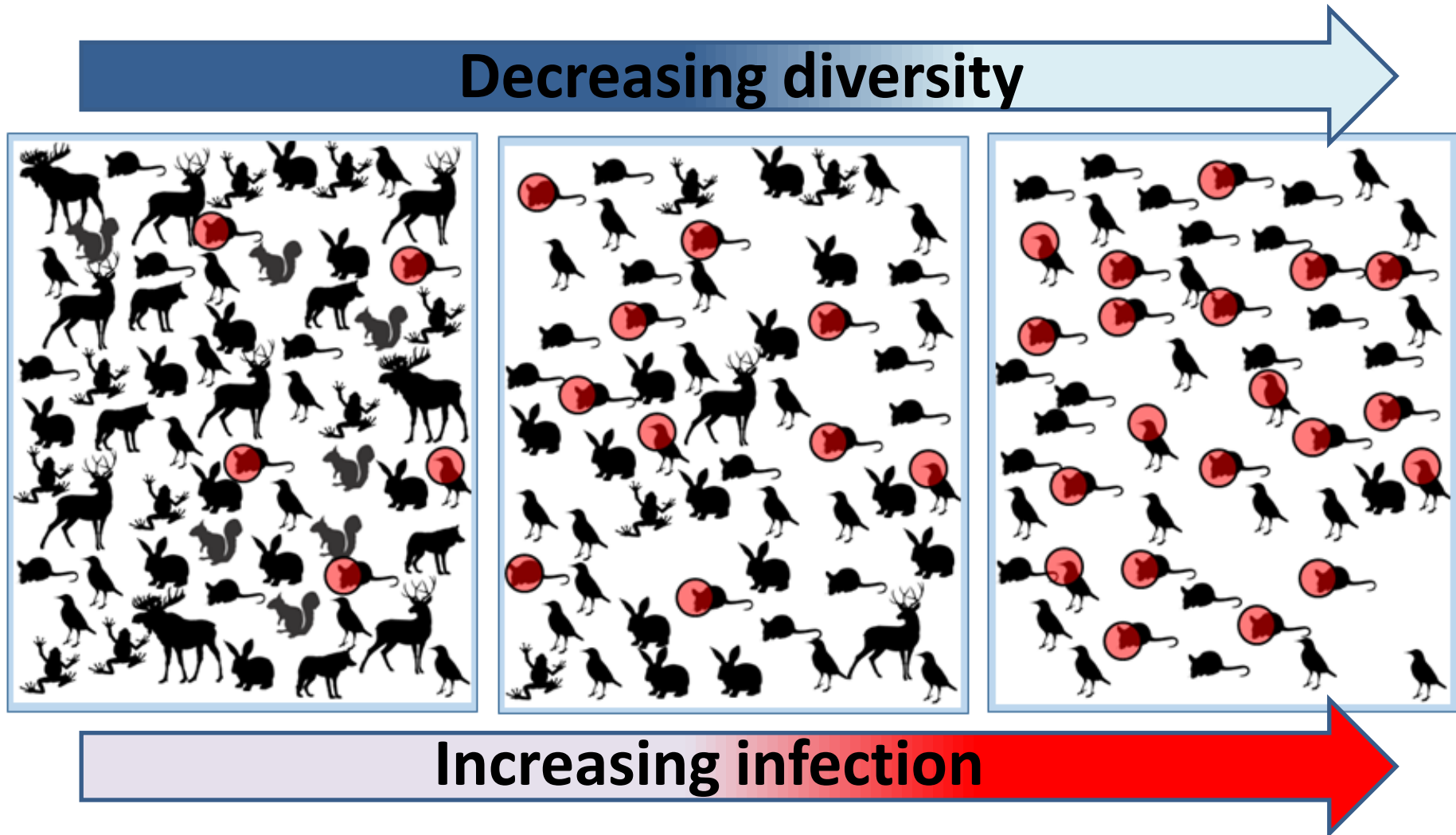


Jones et al. 2008

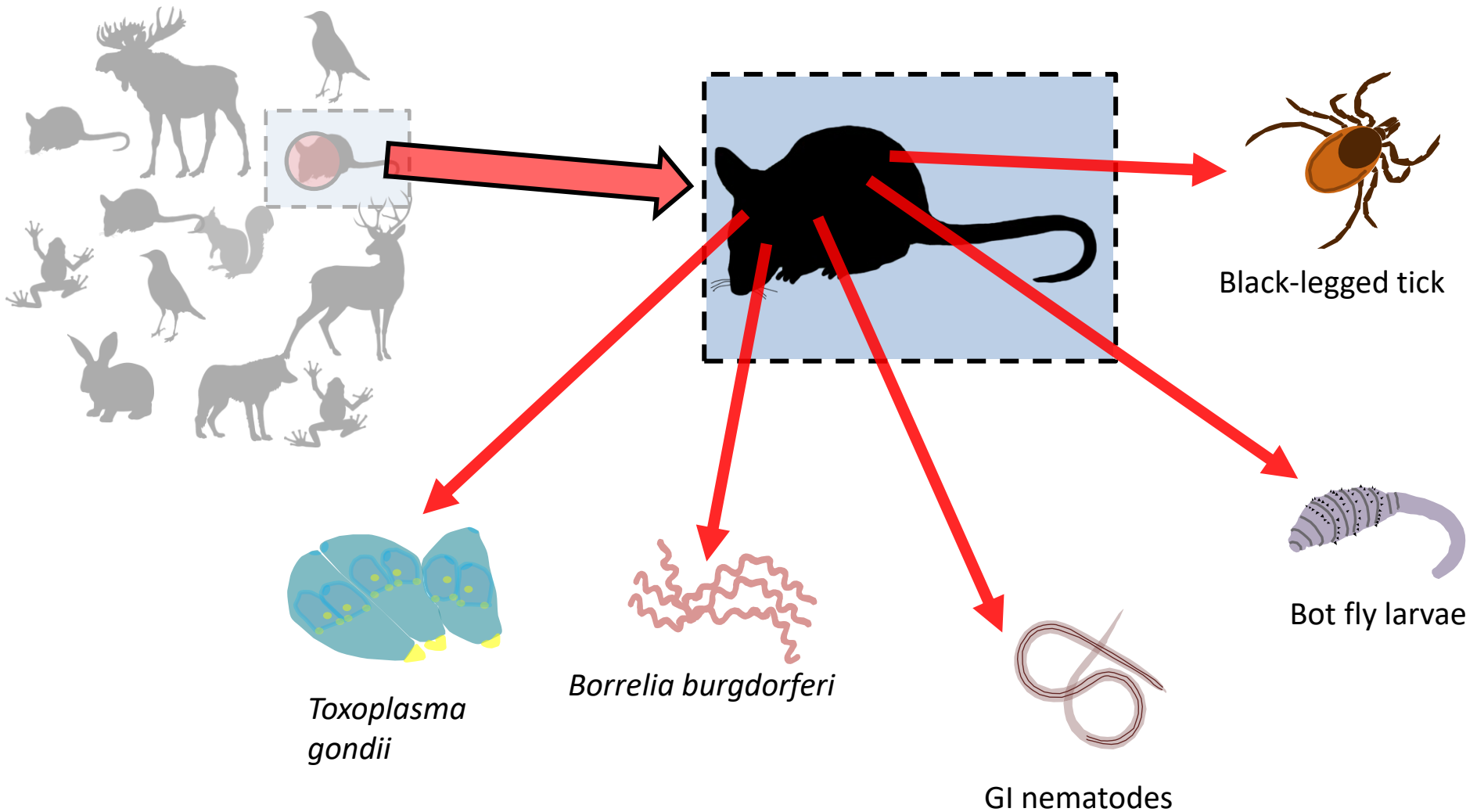
Infection-diversity patterns



The host infection-diversity perspective

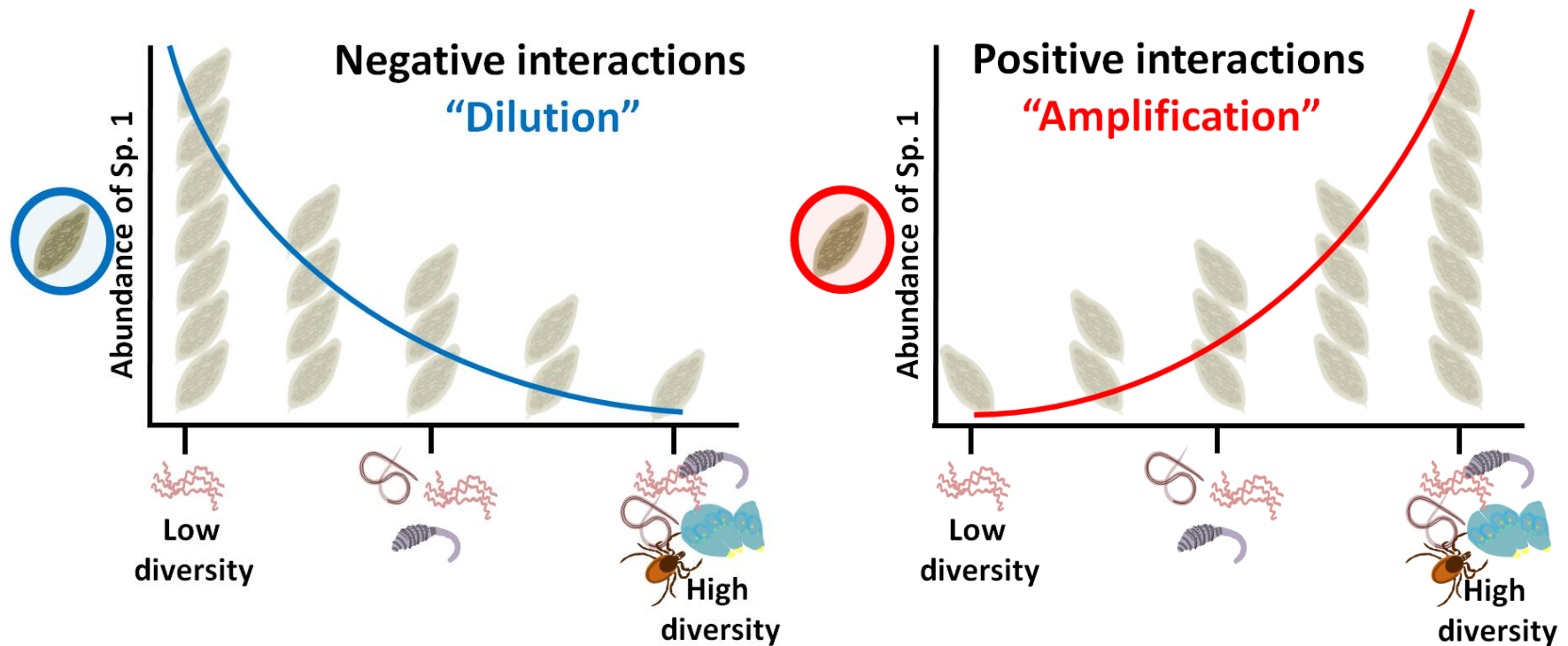


Parasites don't live in a vacuum



Parasite interactions can influence their abundance

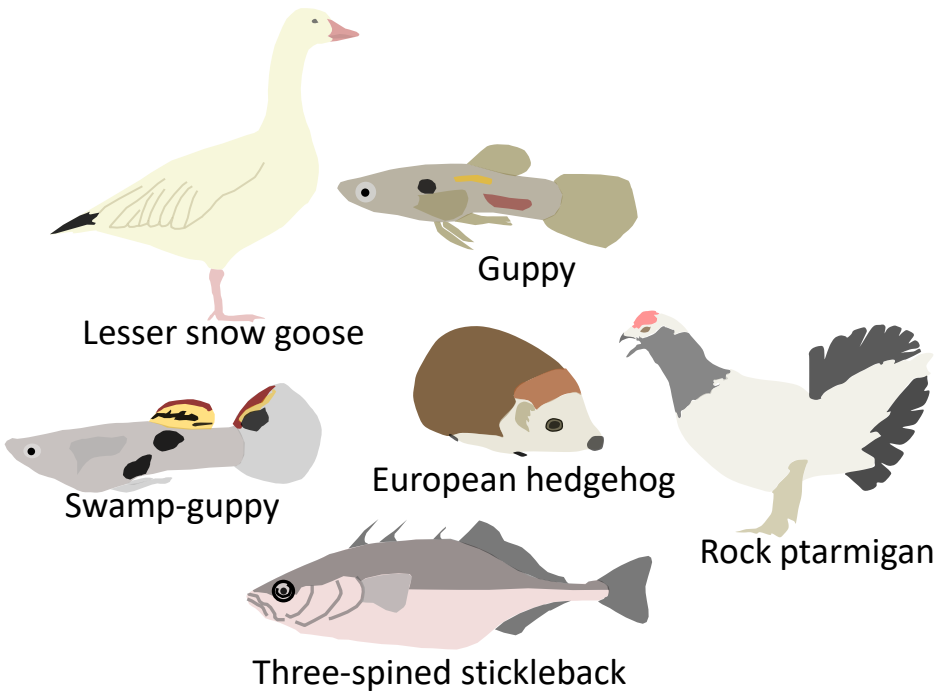
Hypotheses:



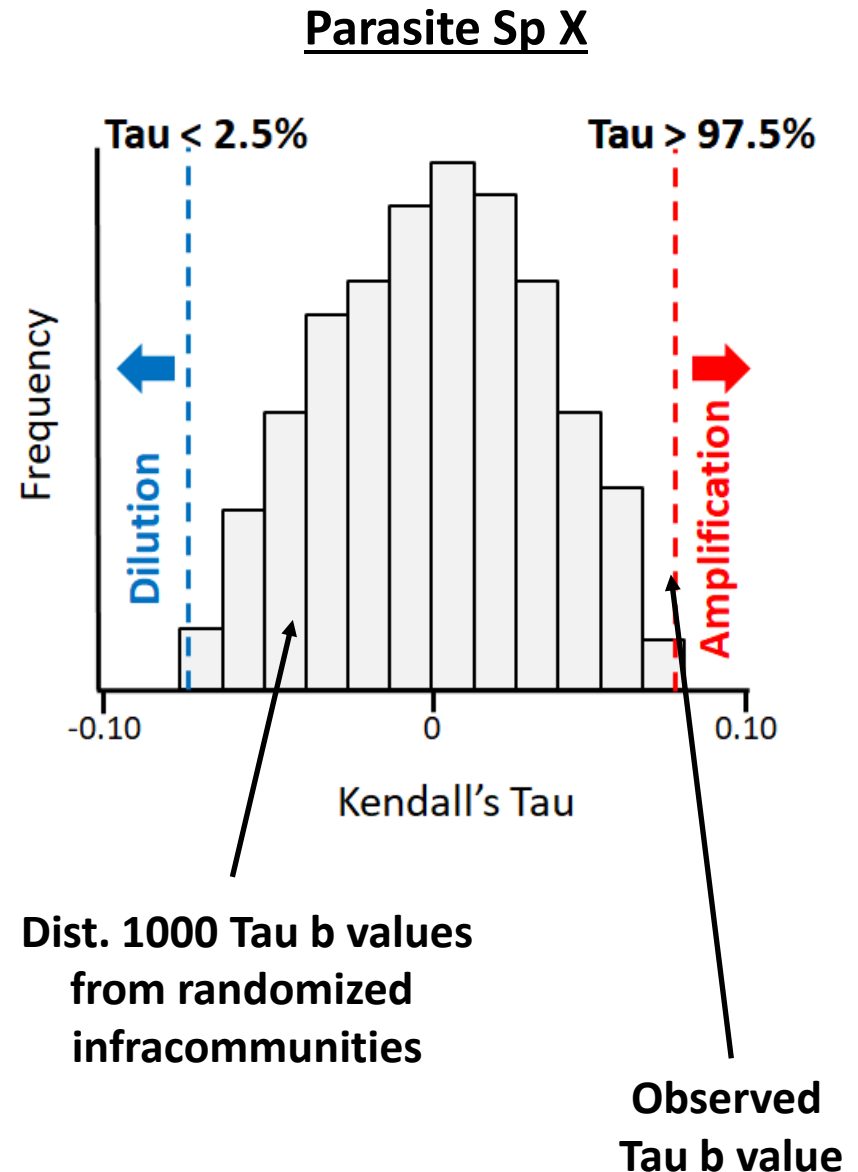
e.g. Competition for space / tissue

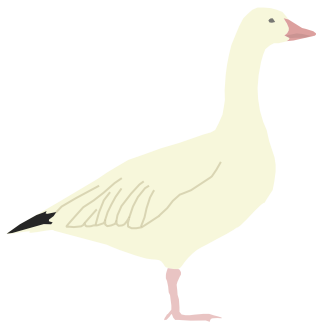
e.g. Active immunosuppression

Methods



- Datasets – hosts with several parasite sps.
 - Prevalence >2%
 - Sp associations not determined by prevalence alone
 - Test parasite abundance-Div.
- Non-parametric rank correlation
Kendall's Tau's b (-ve=Dil.; +ve=Amp.)



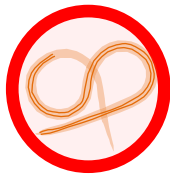


Lesser snow geese parasites show positive abundance-richness correlation

771 hosts; 27 sites North America; G.I. parasites



H. dispar



T. tenuis



D. lanceolata



D. barrowensis



C. anatis



S. gracilis



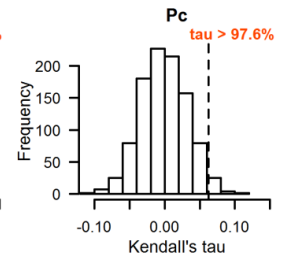
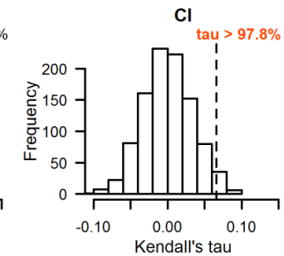
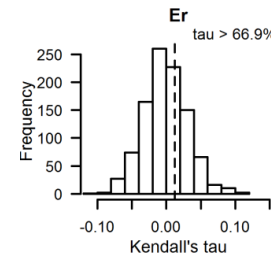
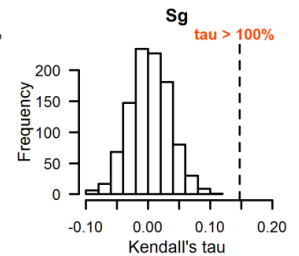
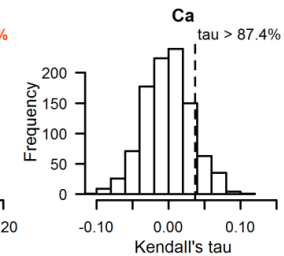
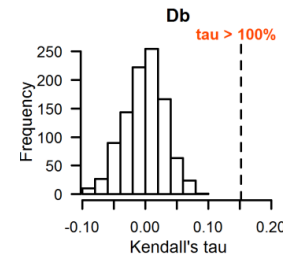
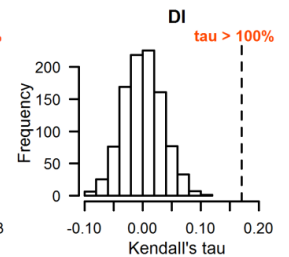
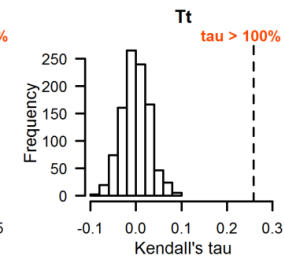
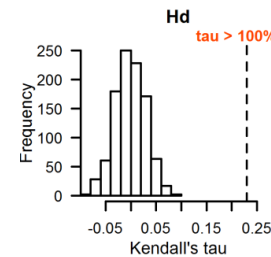
E. revolutum

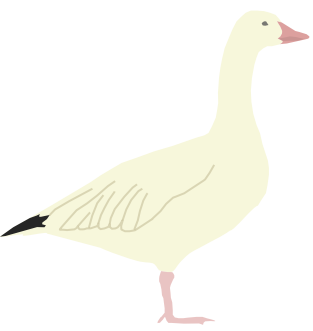


C. longivaginata



P. ciliata





Infracommunities from female or male hosts show the same positive correlation (1 exception)

Females



H. dispar



T. tenuis



D. lanceolata



D. barrowensis



C. anatis



S. gracilis



E. revolutum

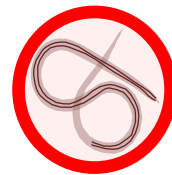


C. longivaginata

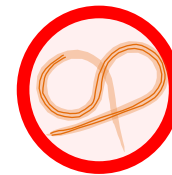


P. ciliata

Males



H. dispar



T. tenuis



D. lanceolata



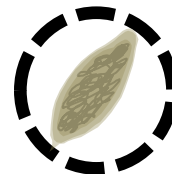
D. barrowensis



C. anatis



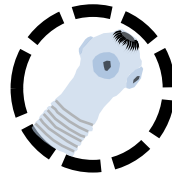
S. gracilis



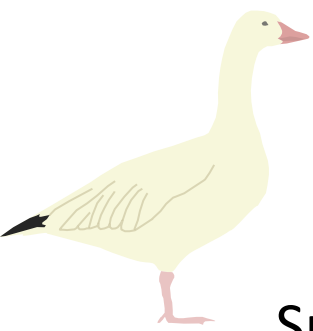
E. revolutum



C. longivaginata



P. ciliata



Infracommunities from subadult or adult hosts show positive correlation – time not a strong explanation

Subadults (15%)



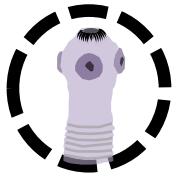
H. dispar



T. tenuis



D. lanceolata



D. barrowensis



C. anatis



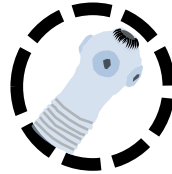
S. gracilis



E. revolutum

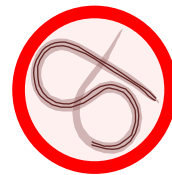


C. longivaginata

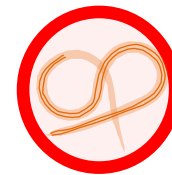


P. ciliata

Adults (85%)



H. dispar



T. tenuis



D. lanceolata



D. barrowensis



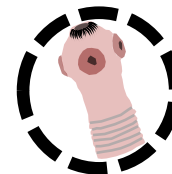
C. anatis



S. gracilis



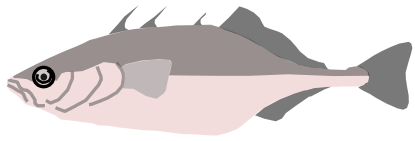
E. revolutum



C. longivaginata



P. ciliata

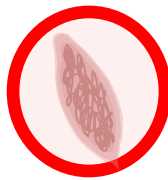


Stickleback parasites show positive abundance-richness correlation

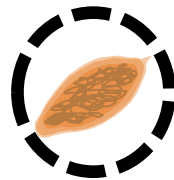
303 hosts; 4 lake-stream pairs Switzerland.
Eye, intestine, body cavity, gills parasites.



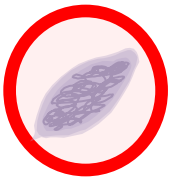
Diplostomum 1



Diplostomum 2



Apatemon sp.



Cyathocotyle sp.



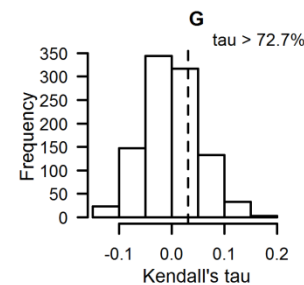
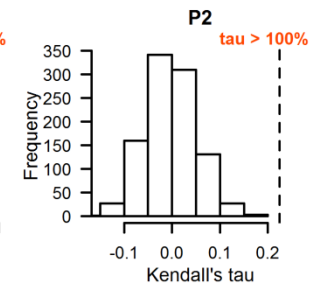
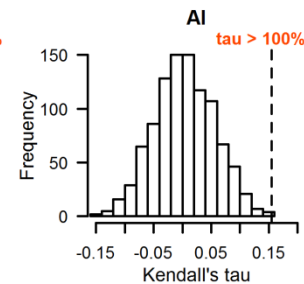
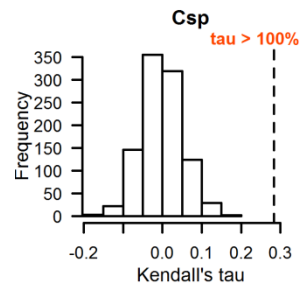
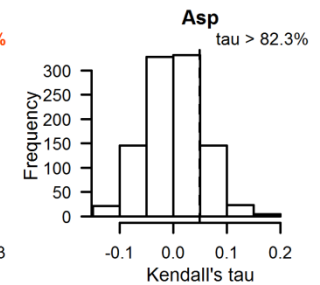
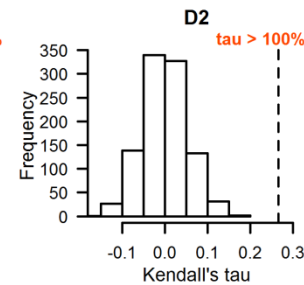
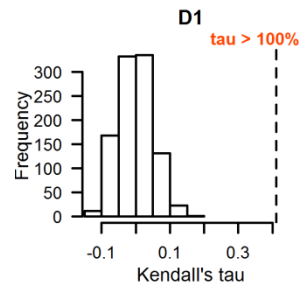
A. lucii



Pomphorhynchus sp.



Glochidia





Guppy and Swamp guppy ...positive correlations



216 male hosts, from across Trinidad
Contagious ectoparasite and endoparasites

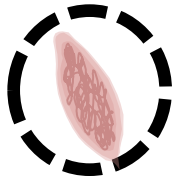
209 male hosts, from across Trinidad
Fresh and brackish water



Gyrodactylus spp.



Trematode spp1



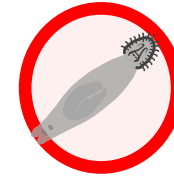
Trematode spp2



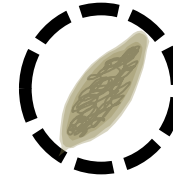
Cestode spp



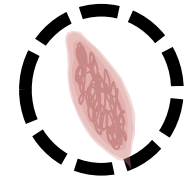
Acanthocephalan spp



Gyrodactylus spp.



Trematode spp1



Trematode spp2



Cestode spp



Acanthocephalan spp



European Hedgehog parasites show positive abundance-richness correlation

70 hosts across Czech Republic.

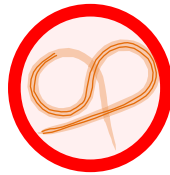
Ecto/Endo parasites (vectors)



A. erinacei



I. hexagonous



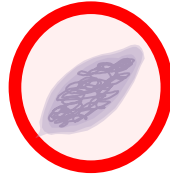
C. striatum



C. aerophila



Capillaria spp.



B. erinacei



P. clausa



P. cylindraceus



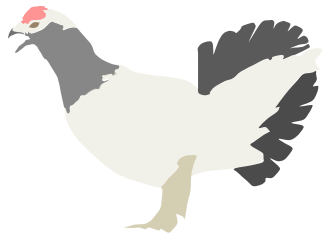
N. major



Nematode spp.

Some nematodes and a trematode, but no ectoparasite, show positive abundance-diversity correlations.

Even, at relatively low infracommunity sample sizes



Rock ptarmigan parasites show positive abundance-richness correlation

631 hosts from northeast Iceland during 10 years.

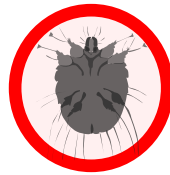
Ecto and endo parasites



C. caudinflata



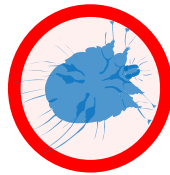
T. tenuis



T. lagopi



S. holoaspis



M. islandicus



M. borealis



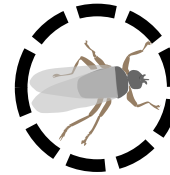
G. lagopi



L. affinis



A. lagopi

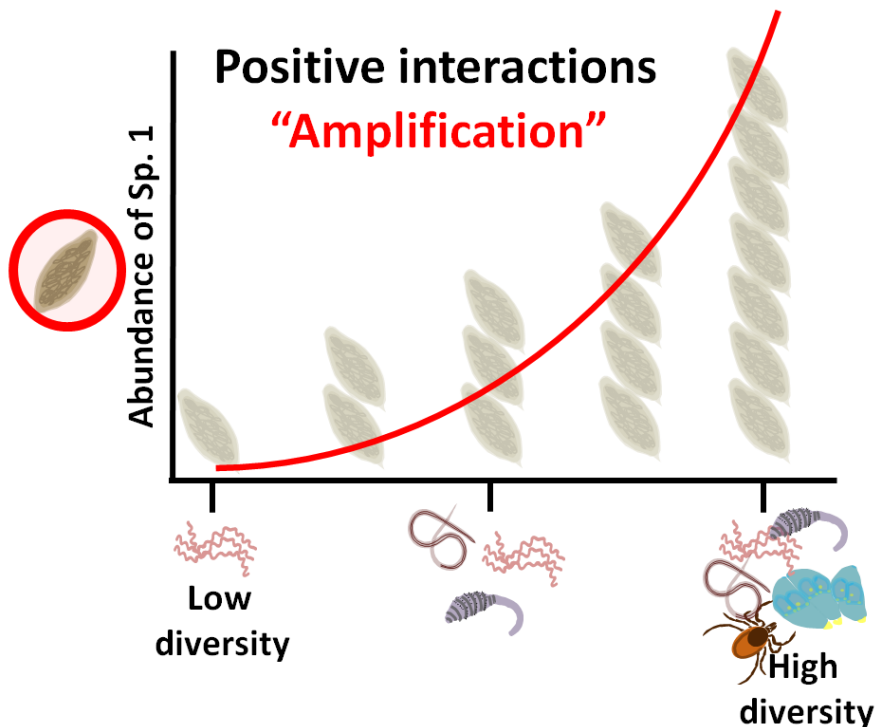


O. chloropus

Ectoparasites using different host tissues show positive abundance-diversity correlations.

1 endoparasite shows negative correlation with endoparasite diversity.

Conclusions and potential mechanisms



Pattern robust to differences in

- Host Sex
- Host Age
- Host taxonomy
- Host habitat use
- Parasite taxonomy
- Parasite ecology

Possible mechanisms

- Temporal effect – accumulation
- Host condition/behaviour
- Parasites facilitate each other

Time for experiments...

Acknowledgements

Collaborators:

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D. McLaughlin, R. Alisauskas,
D. Shutler, G. Fussmann,
A. Hendry, M. Scott,
C. Ghalambor, J. Torres-Dowdall**

For making their data publicly available:

**Stenkewitz et al. 2016
Karvonen et al. 2015
Pfaffle et al. 2014**



uOttawa