

The invasive bank vole (*Myodes glareolus*): A model system for studying parasites and ecoimmunology during a biological invasion

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Background

- 60% of Emerging Infectious Diseases (EIDs) originated from wildlife (Jones *et al.*, 2008).
- From 1,415 pathogenic species infecting humans; 61% zoonotic and 32% helminth species (Taylor, Latham & Woolhouse, 2001).
- Parasites impact fecundity and mortality rates of rodents (Scott & Lewis, 1987; Pedersen & Greives, 2008).
- Need for wildlife models to understand EIDs; rodents present informative model species (Pedersen & Babayan, 2011).

The Irish bank vole invasion

- Depauperate small mammal community in Ireland.
- *Myodes glareolus* suspected arrival in 1920s, with a single introduction point (Stuart *et al.*, 2007).
- Invasion gradient – 2.23-2.63km/year (White *et al.*, 2012)
- No eradication attempts.
- Baseline parasite data for *M. glareolus* and *Apodemus sylvaticus* (native wood mouse) (Loxton *et al.*, 2016, Loxton *et al.*, 2017, Stuart *et al.*, 2020).

Table 1. Helminth species recorded in *A. sylvaticus* and *M. glareolus* (see Loxton *et al.*, 2016; 2017 and Stuart *et al.*, 2020). Names in brackets are previous species names.

<i>A. sylvaticus</i>		
Taxon	Loxton <i>et al.</i> (2016; 2017)	Stuart <i>et al.</i> (2020)
Nematoda	<i>Syphacia stroma</i>	<i>Syphacia stroma</i>
	<i>Aonchotheca murissylvatici</i>	<i>Aonchotheca murissylvatici</i>
	<i>Trichuris muris</i>	<i>Trichuris muris</i>
	<i>Heligmosomoides polygyrus</i>	<i>Heligmosomoides polygyrus</i>
Cestoda	<i>Hymenolepis hibernia</i>	<i>Hymenolepis hibernia</i>
	<i>Skrjabinotaenia lobata</i>	<i>Hymenolepis sp.</i>
	<i>Taenia martis</i>	<i>Skrjabinotaenia lobata</i>
	<i>Hydatigera taeniaeformis</i> (<i>Taenia taeniaeformis</i>)	<i>Taenia martis</i>
		<i>Taenia polyacantha</i>
Trematoda	<i>Brachylaemus recurvum</i>	<i>Brachylaemus recurvum</i>
	<i>Corrigia vitta</i>	<i>Corrigia vitta</i>
Total Sp.	10	12
<i>M. glareolus</i>		
Taxon	Loxton <i>et al.</i> (2016; 2017)	Stuart <i>et al.</i> (2020)
Nematoda	<i>Aonchotheca murissylvatici</i>	<i>Aonchotheca murissylvatici</i>
	<i>Aspicularis tianjinensis</i>	<i>Aspicularis tianjinensis</i>
Cestoda	<i>Taenia martis</i>	<i>Taenia martis</i> <i>Taenia polyacantha</i>
Total Sp.	3	4

Bio-invasion Disease dynamics

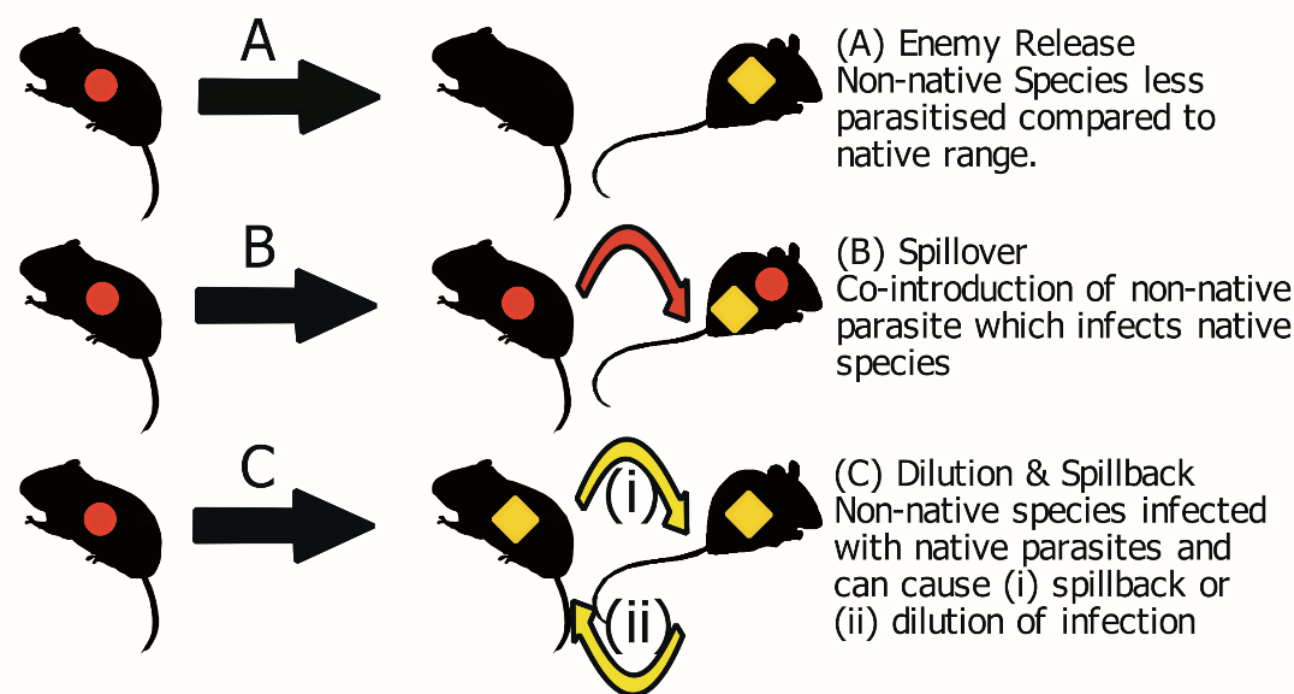


Figure 1. Disease dynamics of a biological invasion. Parasites introduced with the non-native species are indicated by red circles, while parasites from the native host are indicated by yellow diamonds. Adapted from Loxton (2015) and Hatcher and Dunn (2011).

Dynamics in the Irish rodent model

- **Enemy Release:** only 3 species recovered in Irish bank vole population compared to their native range, which carry between 3-14 species.
- **Dilution:** Overall lower Brillouin's Index of Diversity in *A. sylvaticus* at core invaded sites compared to expansion front and uninvaded sites.
- **Spillback:** increased prevalence of *Aonchotheca murissylvatici* in *A. sylvaticus* at core sites invaded by *M. glareolus*.
- **Amplification:** both *Syphacia stroma* and *Skrjabinotaenia lobata* show higher abundances in *A. sylvaticus* at core sites compared to expansion front and uninvaded sites. (Loxton *et al.*, 2016, Loxton *et al.*, 2017, Stuart *et al.*, 2020)

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