Mechanistic models for panel data: analysis of ecological experiments with four interacting species

1 Simulation

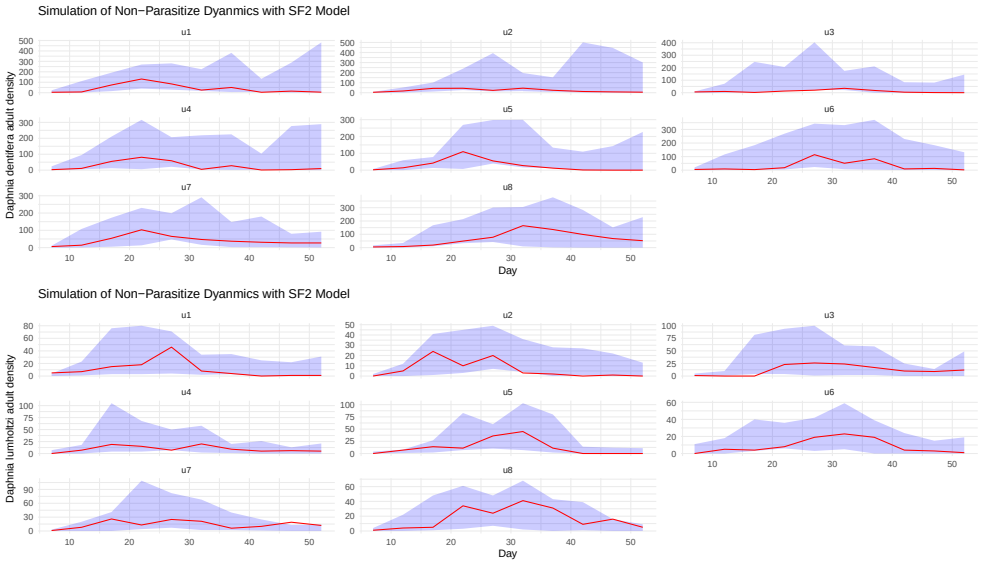

Figure 1: Plot of Simulation of Non-Parasitize Dyanmics with SF2 Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

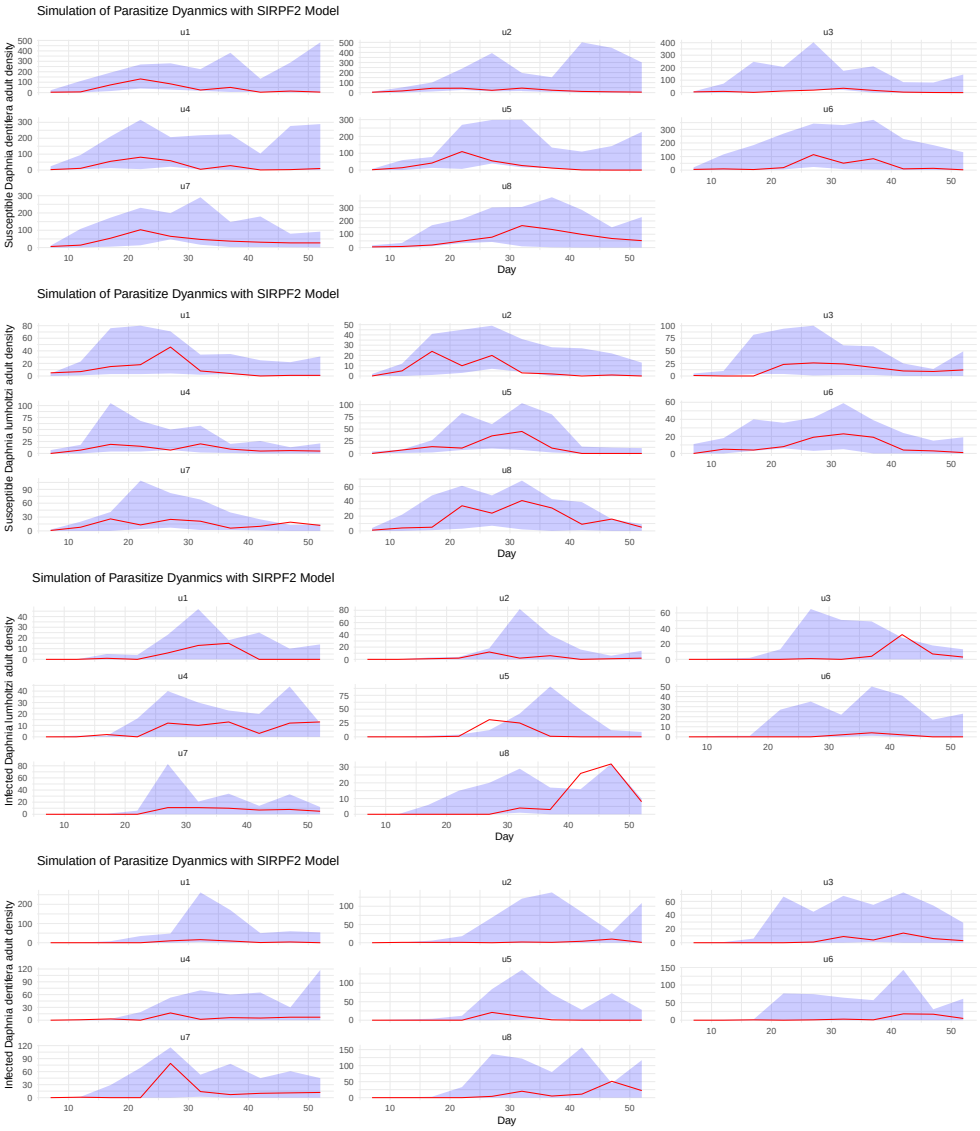

Figure 2: Plot of Simulation of Parasitize Dyanmics with SIRPF2 Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

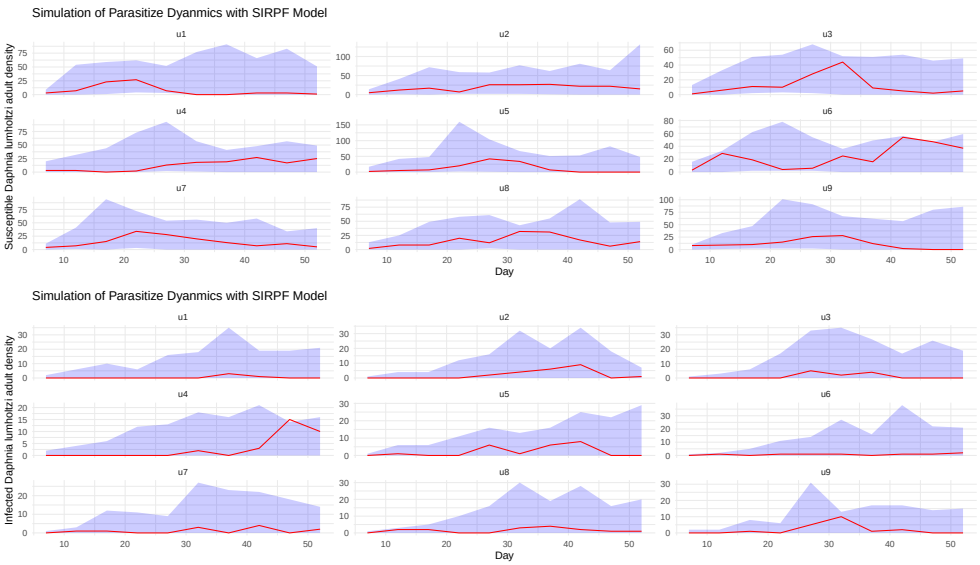

Figure 3: Plot of Simulation of Invasive Parasitize Dyanmics with SIRPF Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

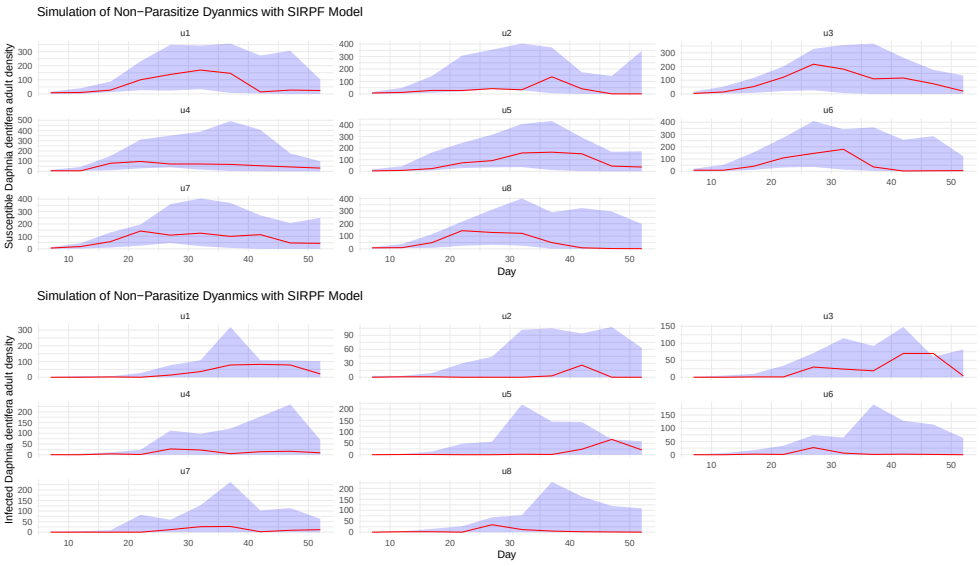

Figure 4: Plot of Simulation of Native Parasitize Dyanmics with SIRPF Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

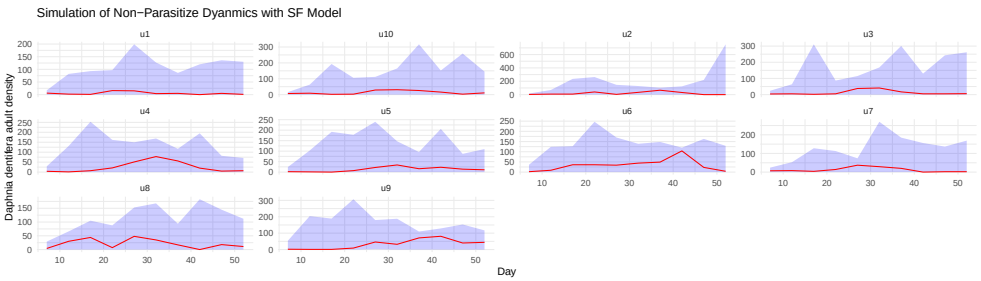

Figure 5: Plot of Simulation of Native Non-Parasitize Dyanmics with SF Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

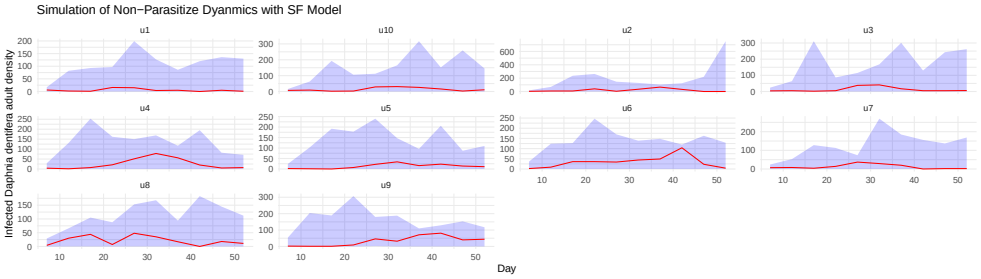

Figure 6: Plot of Simulation of Invsaive Non-Parasitize Dyanmics with SF Model. The blue shadow implies the possible range from simulation, while the red line shows the real-world data. The various trail represents different buckets in the experiment

2 Tables

Parameter	Definition	Unit	
S_j	Susceptible host density for species j	$individuals \cdot L^{-1}$	Variable
I_j	Infected host density for species j	$individuals \cdot L^{-1}$	Variable
F	Alga density	$10^5 cells \cdot L^{-1}$	Variable
P	Spore density	$10^3 spores \cdot L^{-1}$	Variable
K_F	Alga carrying capacity	$10^5 cells \cdot L^{-1}$	0.092
r_n	Native growth rate	$10^{-5} \cdot cells^{-1} \cdot day^{-1}$	0.23
r_i	Invasive growth rate	$10^{-5} \cdot cells^{-1} \cdot day^{-1}$	0.23
θ_{I_n}	Native infected host mortality rate	day^{-1}	0.66
θ_{I_i}	Invasive infected host mortality rate	day^{-1}	0.37
θ_{S_i}	Invasive susceptible host mortality rate	day^{-1}	0.086
θ_{S_n}	Native susceptible host mortality rate	day^{-1}	0.098
θ_P	Spore degradation rate	day^{-1}	0.015
p_n	Native probability of infection per spore	$10^{-3} \cdot individuals \cdot spore^{-1}$	0.92
p_i	Invasive probability of infection per spore	$10^{-3} \cdot individuals \cdot spore^{-1}$	0.98
f_{S_n}	Native susceptible host filtering rate	$L \cdot day^{-1} \cdot individuals^{-1}$	0.00027
f_{S_i}	Invasive susceptible host filtering rate	$L \cdot day^{-1} \cdot individuals^{-1}$	0.00027
f_{I_n}	Native infected host filtering rate	$L \cdot day^{-1} \cdot individuals^{-1}$	0.0018
f_{I_i}	Invasive infected host filtering rate	$L \cdot day^{-1} \cdot individuals^{-1}$	0.000067
δ	Sampling rate	day^{-1}	constant = 0.013
α	Alga maximum exponential growth rate	day^{-1}	0.011
γ_n	Native host consumption rate	$L \cdot inidviduals^{-1} \cdot day^{-1}$	0.000030
γ_i	Invsaive host consumption rate	$L \cdot inidviduals^{-1} \cdot day^{-1}$	0.00067
μ	Alag refilling rate	$10^5 cells \cdot L^{-1} \cdot day^{-1}$	constant = 0.37
ξ	Reduction in infected host reproduction and consumption	$Unitless$	0.00041
β_i	Spores produced per infected invasive species	$10^3 \cdot spores \cdot individuals^{-1}$	3.8
β_n	Spores produced per infected native species	$10^3 \cdot spores \cdot individuals^{-1}$	3.2
σ_{S_n}	Standard deviation of brownian motion of susceptible native	$\sqrt{individual \cdot t^{-1}}$	0.061
σ_{S_i}	Standard deviation of brownian motion of susceptible invasive	$\sqrt{individual \cdot t^{-1}}$	0.11
σ_{I_n}	Standard deviation of brownian motion of infected native	$\sqrt{individual \cdot t^{-1}}$	0.45
σ_{I_i}	Standard deviation of brownian motion of infected invasive	$\sqrt{individual \cdot t^{-1}}$	0.0018
σ_F	Standard deviation of brownian motion of alga	$\sqrt{individual \cdot t^{-1}}$	0.29
σ_P	Standard deviation of brownian motion of parasite	$\sqrt{individual \cdot t^{-1}}$	0.20
k_{S_n}	Overdispersion parameter	$Unitless$	4.5
k_{S_i}	Overdispersion parameter	$Unitless$	5.4
k_{I_n}	Overdispersion parameter	$Unitless$	1.4
k_{I_i}	Overdispersion parameter	$Unitless$	1.2

Table 1: This table shows the units of the parameters of competition SIRPF2 model