Assignment #1

Victoria Peechatt

2024-01-26

Nicholson–Bailey model: This model is spin off of the Lotka-Volterra model which describes competitive and mutualistic interactions between two populations. The Nicholson-Bailey model is specific to host-parasitoid interactions. My study system includes the specialist herbivore (*Euphydryas phaeton*) and its specialist parasitoid (*Cotesia euphydryas*), and I hope to use this model to understand their dynamics with variable stressors. I also possibly want to expand it to include interactions between other trophic levels. (the host plant below the herbivore and the hyper-parasitoid above the parasitoid)

$$H_{t+1} = H_t e^{r(1-H_t/K)} e^{-aP_t}$$

$$P_{t+1} = cH_t(1 - e^{-aP_t})$$

H: population size of the host

P: population size of the parasitoid

r: reproductive rate of the host

K: carrying capacity of the host

a: attack rate of the parasitoid

c: average number of viable eggs the parasitoid lays in a host

Assumptions of the model include 1 - the parasitoid finds hosts randomly and 2 - the hosts and parasitoids are randomly distributed across a landscape. $e^{r(1-H_t/K)}$ is the rate of population growth for the host in a density dependent context and e^{-aP_t} is the probability that the host will survive. $\therefore (1 - e^{-aP_t})$ is the probability that the parasitoid survives.