A Problem Set to Help You Earn Your Academic Patches in Ecological Games

1. For the optimal foraging theory simulation and dynamical modeling exercise that we conducted ($p_1 = 0$, $c_1 = 1$, $f_1 = 0$, $v_1 = 0$, $p_2 = 0.5$, $c_2 = 1$, $f_2 = 0.5$, $v_2 = 4$), please complete a table containing results for cases in which an organism were to begin with energy Q_i = 1, 2, or 3 units at time interval t = 1. The table should cover the period t = 1 through 4 and include initial energies $Q_{i,j}$, final energies $Q_{f,j}$, and survival Probabilities P(survival, j) for patches j = 1 and 2.

2. For the optimal foraging theory simulation and dynamical modeling exercise that we conducted ($p_1 = 0$, $c_1 = 1$, $f_1 = 0$, $v_1 = 0$, $p_2 = 0.5$, $c_2 = 1$, $f_2 = 0.5$, $v_2 = 4$):

(a) please state the patch-selection strategy that maximises the probability for an organism to survive until t = 4 if that organism were to begin with energy Q_i = 2 units at time t = 1.

(b) please identify the patch on which the probability for an organism to survive the time interval t = 3 is greatest if the organism were to begin that time interval with energy Q_i = 2 units.

(c) please identify the patches on which the probability for an organism to survive the time period spanning from t = 2 until t = 3 inclusive (*i.e.*, from beginning to end) is maximised if an organism were to begin time interval t = 2 with energy Q_i = 1.5 units.

3. According to the optimal foraging theory simulation and dynamical modeling exercise that we considered ($p_1 = 0$, $c_1 = 1$, $f_1 = 0$, $v_1 = 0$, $p_2 = 0.5$, $c_2 = 1$, $f_2 = 0.5$, $v_2 = 4$), the optimal patch-selection strategy to maximise the probability for surviving until t = 4 for an organism beginning time interval t = 1 with energy Q_i = 3 units is 1 2 2 1. Please state whether the patch order matters and explain your reasoning using as few words as you can.

4. For the optimal foraging theory simulation and dynamical modeling exercise that we considered ($p_1 = 0$, $c_1 = 1$, $f_1 = 0$, $v_1 = 0$, $p_2 = 0.5$, $c_2 = 1$, $f_2 = 0.5$, $v_2 = 4$), at t = 2 on patch 2, the survival probability (*i.e.*, until t = 4) for an organism possessing energy Q_i = 3 is the same as that for an organism possessing energy Q_i = 2 units; however, on patch 1, the survival probability for an organism possessing energy Q_i = 3 is much greater than the that for an organism possessing energy Q_i = 2 units. Please explain why using as few words as you can.