

BI 471/571: Population Ecology

Problems 5: predator-prey

Due 5/13/2016

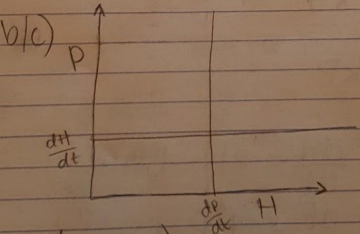
1. Hastings Problems 8.1, 8.3, 8.4

(8.1) original equations

$$\frac{dH}{dt} = rH - bHP$$
$$\frac{dP}{dt} = cHP - kP$$

a) $\frac{dP}{dt} = c(mP)HP - kP$
constant
 $f(P) = m \cdot P$

b/c)



d) $\begin{pmatrix} 0 & - \\ + & 0 \end{pmatrix} ?$

e) unstable

8.1)

(8.3) equations

$$\frac{dH}{dt} = rH \left[1 - \frac{H}{K} \right] - bHP$$
$$\frac{dP}{dt} = cHP - kP$$

effect of pesticide (represented by z)

$$\frac{dH}{dt} = z r H \left[1 - \frac{H}{K} \right] - bHP$$
$$\frac{dP}{dt} = z c H P - kP$$

8.3)

(8.4) equations $\frac{dH}{dt} = RH - bHP$
 $\frac{dP}{dt} = cHP - kP$

prey refuge

a) $\frac{dH}{dt} = RH - b(1-E)HP$ where E is amount of prey in refuge
 $\frac{dP}{dt} = c(1-E)HP - kP$
 change in pred pop b/c of change in prey density

b) $\frac{dH}{dt} = 0$ $\frac{dP}{dt} = 0$
 $\frac{dH}{dt} = RH - b(1-E)HP = 0$ $P = R/b(1-E)$
 $\frac{dP}{dt} = c(1-E)HP - kP = 0$ $H = k/c(1-E)$
 $>0 \rightarrow <0$

c) refuges definitely help keep prey pop stable, thus creating pred pop stability

8.4)

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