

10-24-05

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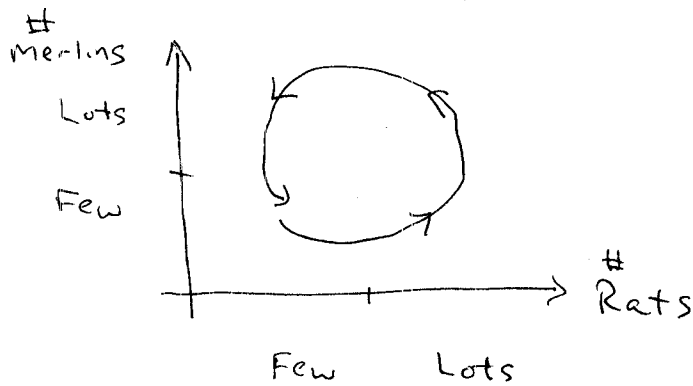
Ch 7 Reading Questions now on Moodle

All Reading Questions open through Sun 11:55 PM

Tests back next time.

Models Relating Two Species

Rats, Merlins



Today -

Write Equations

So we

can calculate

& Put in Excel

Lotka Volterra

$r = \# \text{ rats}$

$m = \# \text{ merlins}$

$$\frac{\Delta r}{\Delta t} = \text{births} - \text{deaths} = \overset{B}{\text{birth rate}} * r - \overset{D}{\text{death rate}} * r = \frac{\Delta r}{\Delta t}$$

$$\frac{\Delta m}{\Delta t} = \text{births} - \text{deaths} = \text{birth rate} * m - \text{death rate} * m = \frac{\Delta m}{\Delta t}$$

rat birth rate (constant) .9

rat death rate (depends on # merlins) (.03) * m

merlin death rate (constant) .01667 = $\frac{1}{60}$
 merlin birth rate merlins live 60 months

(depends on rats) .00001667 * r

$$\frac{\Delta r}{\Delta t} = \overset{\text{b rate}}{.9r} - \overset{\text{d rate}}{.03 \cancel{m} r}$$

Interaction terms

$$\frac{\Delta m}{\Delta t} = \underset{\text{b rate}}{.00001667 \cancel{r} m} - \underset{\text{d rate}}{.01667 \cdot m}$$

With a negative interaction term for Δr
 the rat pop. will decrease (prey)
 With a positive interaction term for Δm
 the merlin pop. will increase. (predator)

Calculate pops of r, m from
 month to month.

$$\begin{aligned} \text{new } r &= \text{old } r + \Delta r \\ \text{new } m &= \text{old } m + \Delta m \end{aligned}$$

$$\text{old } r = 950, \text{ old } m = 28$$

$$\begin{aligned} \text{new } r &= 950 + \overset{\Delta r}{.90(950)} - .03(\overset{m}{28})(\overset{r}{950}) \\ &= 1007 \end{aligned}$$

$$\begin{aligned} \text{new } m &= 28 + .00001667(950)(\overset{m}{28}) - .01667(\overset{m}{28}) \\ &= 27.97 \end{aligned}$$

old r = 1000 m = 30 Equilibrium Point.

$$\begin{aligned} \text{new } r &= \frac{1000}{+} \\ &= 1000 \end{aligned}$$

$$\begin{aligned} \text{new } m &= \frac{30}{+} \\ &= 0 \end{aligned}$$