POPULATION GROWTH

1. POPULATIONS

theoretical ecology
- predictions based on past events
- large pop & stable / favorable envi

population size = N
time = t
population growth rate = **D**N/**D**t
- change in N divided by change in time
- tendency of pop to grow despite limits to growth imposed by envi

2. EXPONENTIAL GROWTH

J - curve - exponential growth

$dN / dt = r N$

dN / dt = instantaneous growth rate

growth rate = r - also biotic potential
or intrinsic rate of increase

exponential increase
- like compound interest
- offsprings also begin to reproduce

opportunist species - weeds, insects
- small organisms in unstable envi
- low survival rate, need high repro rate

3. LOGISTIC GROWTH

S - curve - sigmoidal or logistic growth

$dN / dt = r N (K–N)/K$

K = carrying capacity (or saturation level)
- level where pop stops growing & in equilibrium with resources

equilibrium species - birds & mammals
- larger animals in stable envi
- decent survival rate, lower repro rate

4. ALLEE EFFECT

pop growth - highest at moderate densities
- declines at both low & high densities

at low densities
low birth - difficult find mate, lack social stim for repro, lack genetic diversity
high death - lack protect, statistical risk
- could lead to extinction

at high densities
low birth - compete, repro failure, stress
high death - predators, disease, stress
- could lead to emigration

5. POP. FLUCTUATIONS

negative feedback - maintain pop close to K
- primarily density dependent ?

fluctuations - not perfect, time lag

(1) chaotic - deviations large & irregular
- usually weather-related

(2) cyclic - oscillations at regular intervals
- periodic changes in simpler envi
- or genetic/endocrine characteristics

(3) damped - fluctuations decr with time