6 Lecture — More competition

R ← Abiotic

"Chemostat"

$$\frac{dR}{dt} = K - BR$$

input parameter

BR = proportional

C ↑ αRC ← R

$$\frac{dR}{dt} = K - BR - \alpha RC$$

encounter rate, attack rate

$$\frac{dC}{dt} = b\alpha RC - mC$$

$$0 = K - BR$$

$$R^* = \frac{K}{B}$$

Quasi-equilibrium for R.

i.e. assume fast R-dynamics relative to C

1) Find R equilibrium

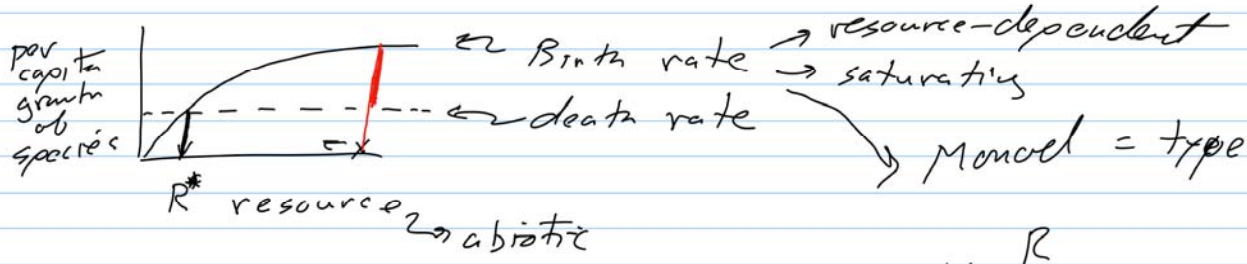
$$\frac{dR}{dt} = 0 \qquad 0 = K - BR - \alpha RC$$

2) Substitute R^* into $\frac{dC}{dt}$ equation. Simplify

R^* Competition Theory

- more explicit inclusion of resources

1) Single Resource, Single Species

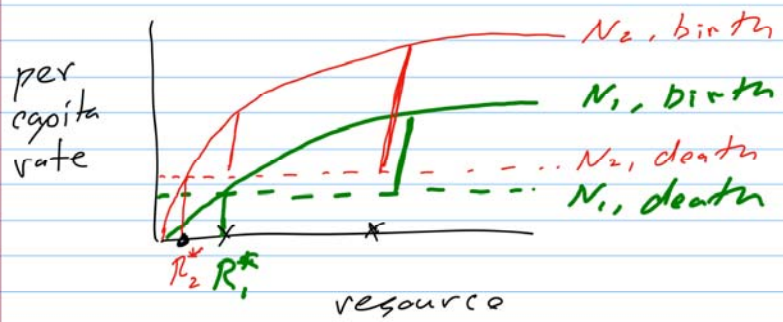


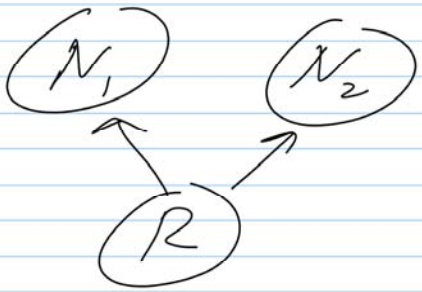
→ resource-dependent
→ saturating

→ Monod = type II

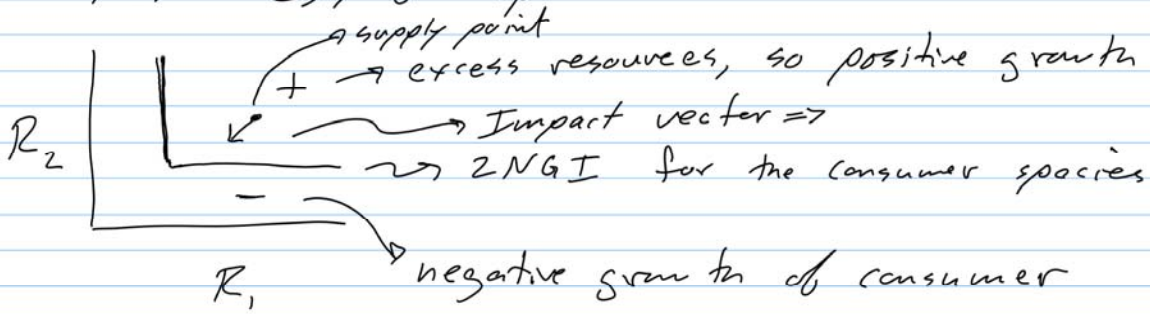
$$\alpha N \frac{R}{k + R}$$

2) Single Resource, 2 species





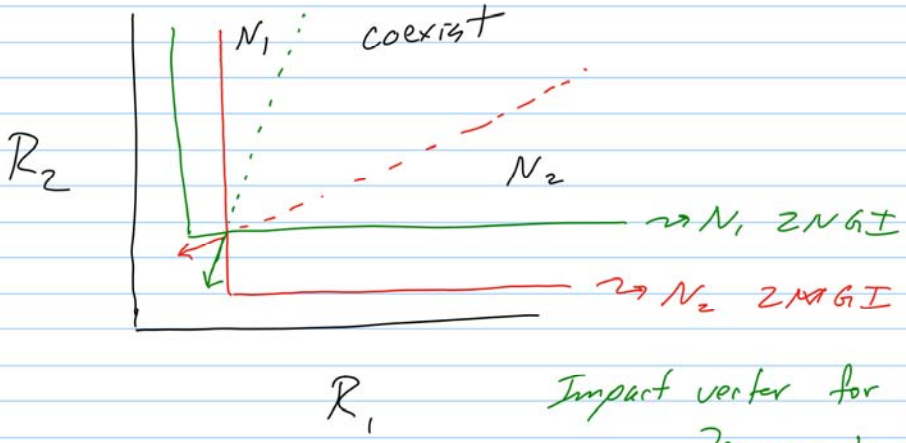
3) Two Resources, One Species



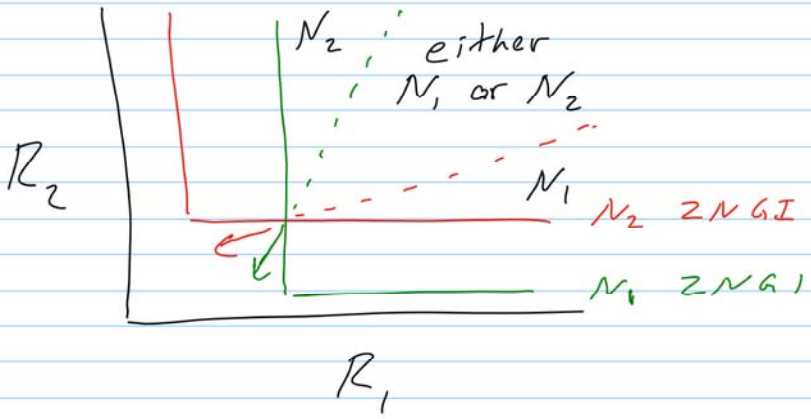
Essential Resources

non substitutable

4) Two Resources, Two Species



Impact vector for N_1
=> more limited by R_2



(C)
↓
(R)

$$\frac{a\,RN}{K+R}$$

consumption of resource

non-substitutable

$$\text{Min}\left[f(R_1)\text{-in}, f(R_2)\text{-in} \right]$$