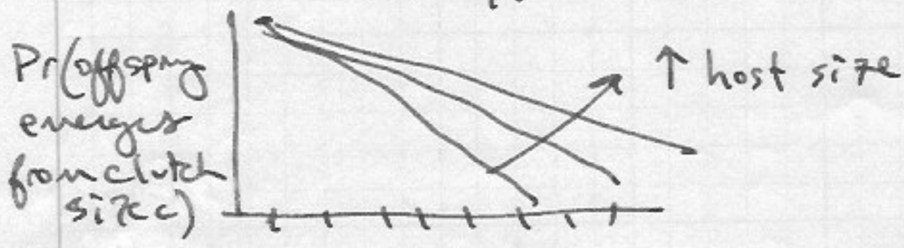
Canonical Equation for Allocation Processes

Ⓐ { - Pro-ovigenic ~ insect emerges w/ all eggs matured
  - Syn-ovigenic ~ mature eggs through life

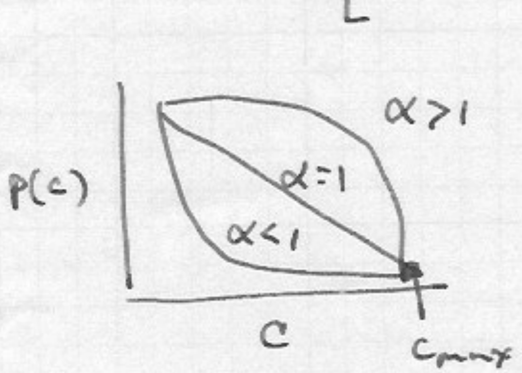
{ - solitary - one egg per host
Ⓐ - gregarious - many eggs per host

- Hosts come in various sizes
- Chance that offspring survives to emerge from host declines w/ eggs laid

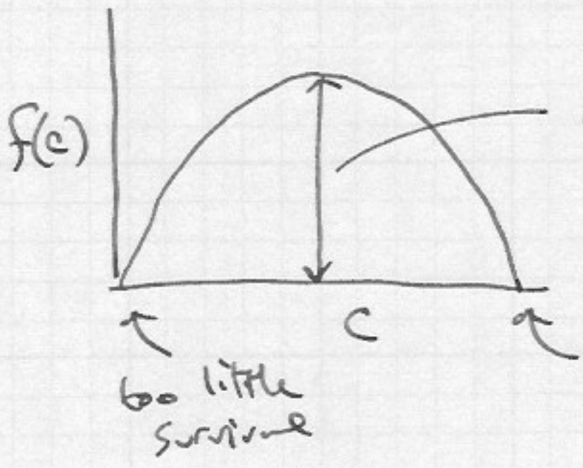


Model for $p(c)$ $\qquad s_0 \sim 0 \le s_0 \le 1$

$$p(c) = s_0\left[1 - \left(\frac{c-1}{c_{max}-1}\right)^{\alpha}\right]$$



$$f(c) = E\{\#\text{ of offspring emerging from clutch of size } c\}$$
$$= c\,p(c)$$



- A parasite is born with X eggs
  - encounters only one kind of host
  - Lack clutch size is c^*
  - If parasitoid were garaunteed life until all eggs are laid, optimal clutch size is 1/host

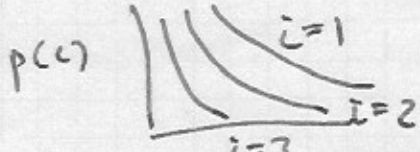
μ_s = mortality rate while searching for host
μ_c = mortality rate when c eggs are laid in a host

$$\Pr(\text{female survives one unit of search}) = e^{-\mu_s}$$

$$\Pr(\text{female survives laying a clutch of size } c) = e^{-\mu(c)}$$

$$\emptyset \le \mu_s \le \infty$$
$$\emptyset \le \mu(c) \le \infty$$

Consider multiple host types, of type i



λ_i = prob finding host i
$1 - \sum \lambda_i$ = prob of no encounters

16.3 $X(t)$ = egg compliment @ t

T = time of first frost

- if female egg number is held constant, Clutch size ↑ as $t \to T$

$F(x, t)$ = Maximum expected accumulated offspring production btw t + T given egg compliment is $X(t) = x$

$F(x, T) = \emptyset$

~~$X(t)$ = egg compliment @ t~~

~~$F(x,t)$ = max.~~

$$F(x,t) = \underbrace{(1-\Sigma\lambda_i)}_{\text{No encounter}}\underbrace{e^{-\mu s\cdot 1}}_{\text{survives}}\underbrace{F(x, t+1)}_{\text{no change in egg comp.}}$$

$$+ e^{-\mu s \cdot 1}\sum_{i=1}^{I} \lambda_i \max_c \left\{ f_i(c) + e^{-\mu(c)} F(x-c, t+c+t_a)\right\}$$

t_a = time it takes to access host

$\mu(c) = \mu_0 \cdot c$ ~ mortality rate for laying one egg

Maximization results in $C^*(x, i, t)$ = optimal clutch size for individual given host type i @ time t when ♀ has x eggs

as μ_0 ↑, $e^{-\mu_0 c}$ ↓, which ↓ future fitness and ↑ $f(c)$ relatively

i.e. less likely you will survive ∅, so current fitness more important, so expect ↑ clutch size for ↑ μ_0