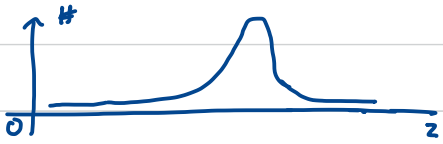
Gizzard Shad Model

Let $n(t,z)$ be the length (in cm) distribution of gizzard shad at time t (years):

At time t:



where # of fish of length $a \le z \le b$ at time t is $\int_a^b n(t,z)\,dz$

Growth $P(z',z) = s(z)\,G(z,z')$ where $s(z)$ is length dependent survival

- assumed to have 4 parameter logit form with values equal to carp

and $G(z,z') = \text{Prob}(z' \mid z, L_\infty, r, \sigma_g) = \text{Norm}(\mu_g, \sigma_g)$

where $\mu_g = L_\infty(1-e^{-r}) + z(t)e^{-r}$

Fecundity: $F(z',z) = p_b(n(t,z))\,\text{eggs}(z)\,\nu\,s_0(n(t,z))\,C_1(z',z)$

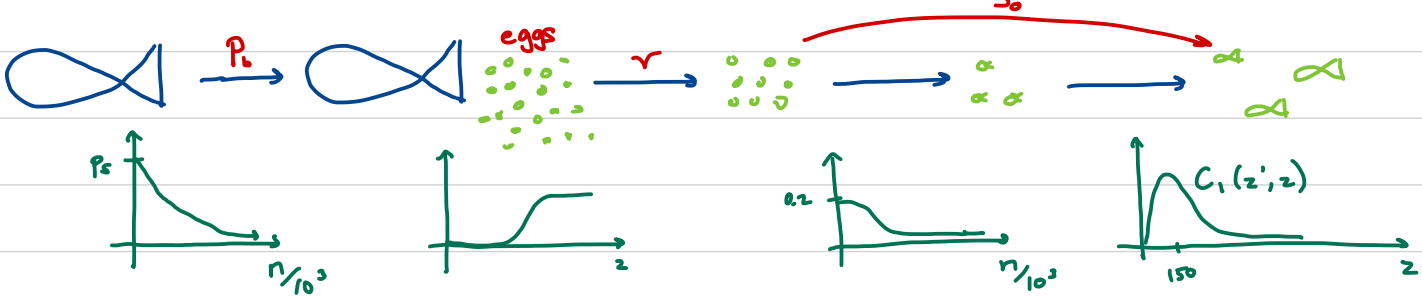
where p_b is probability of female (of length ≥ 140cm) spawning

assume $p_b(n) = p_s \exp(-r_s\, n(t,z)/10^3)$ — density

eggs(z) is 3 parameter logit model with min 0

ν is probability egg is viable (becomes age-0 fish)

$s_0(n(t,z))$ is probabality age-0 fish survives to age-1 fish



$$n(t+1,z') = \int_L^U \left(P(z',z) + F(z',z)\right) n(t,z)\,dz$$