Notes on steepness and myers initial slope

From steepness and natural mortality rate we can calculate Myers maximum rate of increase per year

from myers paper the annual rate of increase is

$$\tilde{\alpha} = \alpha SBPR_{F=0}(1 - p_s)$$

the terms are

$\tilde{\alpha}$ annual rate of increase

α slope through the origin of spawner recruit curve

$SBPR_{F=0}$ spawning biomass per recruit in the absence of fishing

p_s survival from natural mortality

if we use the standard Beverton-Holt curve with steepness (z) we normally write it as

$$R = \frac{S}{a + bS}$$

with the values of a and be defined from recruits in the virgin state (R_0), spawning biomass in the virgin state ($R_0\ SBPR_{F=0}$) an z as

$$a = \frac{B_0}{R_0}\left(1 - \frac{z - 0.2}{0.8z}\right)$$

$$B_0 = R_0 SBPR_{F=0}$$

$$\alpha = \frac{1}{a}$$

thus

$$\tilde{\alpha} = \frac{1 - p_s}{1 - \frac{z - 0.2}{0.8z}}$$

So the annual rate of increase depends only on survival and z.