Stock-recruitment functions in relation to ecological theory

fish5106stockrec Spawning stock, recruitment and production

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Relating ecological models to fisheries

A typical model for insects

$$N_{t+1} = N_t + rN_t(1 - N_t/K)$$

A typical model for fish

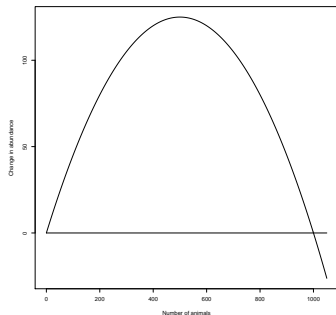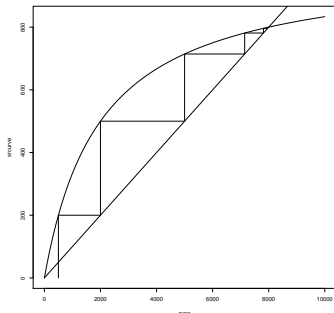$$B_{t+1} = B_t + rB_t(1 - B_t/K) - Y_t,$$

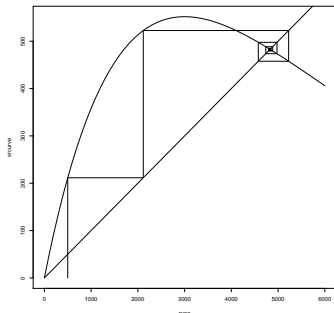Figure : Change in animal abundance as a function of initial state.

Convergence

In the case of the B-H stock-recruitment curve and low fishing mortality, the stock will converge to an equilibrium.
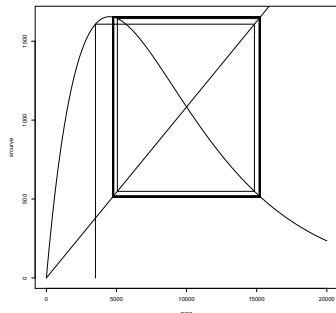
Damped oscillations

When a Ricker curve has a slight negative slope and F is low, the stock converges to an equilibrium through damped oscillations

Oscillations

In specific cases the stock can simply oscil-
late around an equilibrium point.

Chaos

When the right-hand limb of the Ricker Stock-recruitment curve has a steep negative slope, potential chaos ensues.