

Population

$$x_i(t) = \begin{cases} 1 & \text{if site } i \text{ occupied by } \text{🦆} \text{ at time } t \ (1 \leq i \leq N) \\ 0 & \text{if site } i \text{ occupied by } \text{🦃} \text{ at time } t \ (1 \leq i \leq N) \end{cases}$$

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We are interested in $\mathbb{E}[\bar{X}]$,
the expected (\mathbb{E}) proportion (\bar{X}) of altruists in the population.

Social interactions

Social interactions affect fecundity

In a deme with k :

$$\begin{aligned} f_{\text{green duck}} &= 1 + \omega \left(b \frac{k-1}{n-1} - c \right), \\ f_{\text{brown duck}} &= 1 + \omega \left(b \frac{k}{n-1} \right). \end{aligned}$$

Selection is weak

$$\omega \ll 1.$$