

Coalescent
event

Last offspring is ancestral

Last offspring is derived

$$\begin{aligned}
P_s \left[\frac{i_o}{n_o} \middle| \frac{i_c}{n_c} \right] = & \left(\frac{1 - (n_c - 1)}{N} \right) \frac{n_c - i_c}{n_c} P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c}{n_c - 1} \right] \\
+ & \frac{n_c - i_c}{N} P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c}{n_c} \right] \\
+ & \left(1 - \frac{n_c - 2}{N} \right) \frac{i_c}{n_c} s \left(1 - \frac{n_c - 1}{N} \right) \frac{n_c - i_c}{n_c - 1} P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c - 1}{n_c - 2} \right] \\
+ & \frac{i_c}{N} s \frac{n_c - i_c}{N} P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c}{n_c} \right] \\
+ & \frac{i_c}{N} s \left(1 - \frac{n_c - 1}{N} \right) \frac{n_c - i_c}{n_c} P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c}{n_c - 1} \right] \\
+ & \left(1 - \frac{n_c - 1}{N} \right) \frac{i_c}{n_c} s \left(\frac{n_c - i_c}{N} \right) P_s \left[\frac{i_o}{n_o - 1} \middle| \frac{i_c - 1}{n_c - 1} \right] \\
\\
+ & \left(\frac{1 - (n_c - 1)}{N} \right) \frac{i_c}{n_c} (1 - s) P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c - 1}{n_c - 1} \right] \\
+ & \frac{i_c}{N} (1 - s) P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c}{n_c} \right] \\
+ & \left(1 - \frac{n_c - 2}{N} \right) \frac{i_c}{n_c} s \left(1 - \frac{n_c - 1}{N} \right) \frac{i_c - 1}{n_c - 1} P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c - 2}{n_c - 2} \right] \\
+ & \frac{i_c}{N} s \frac{i_c - 1}{N} P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c}{n_c} \right] \\
+ & \frac{i_c}{N} s \left(1 - \frac{n_c - 1}{N} \right) \frac{i_c}{N} P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c - 1}{n_c - 1} \right] \\
+ & \left(1 - \frac{n_c - 1}{N} \right) \frac{i_c}{n_c} s \frac{i_c - 1}{N} P_s \left[\frac{i_o - 1}{n_o - 1} \middle| \frac{i_c - 1}{n_c - 1} \right]
\end{aligned}$$

