Homework 2

Jane Sullivan
jane.sullivan2@alaska.gov

$n_y = M_y + F_y$

$$L(n_1, \ldots n_y | p) = \prod_{i=1}^{y} \left(\frac{(M_i + F_i)!}{M_i!\,(F)} \right) p^{M_i} (1-p)^{F_i}$$

$$\ln L(n_y | p) = \sum_{i=1}^{y} \ln \left(\frac{(M_i + F_i)!}{M_i!\,(F)} \right) + M_i \ln p + F_i \ln (1-p)$$

$$\frac{d \ln L(n_y | p)}{dp} = 0 + \frac{\sum_{i=1}^{y} M_i}{p} - \frac{\sum_{i=1}^{y} F_i}{1-p}$$

Set derivative equal to 0

$$p(1-p)\left[\frac{\sum_{i=1}^{y} M_i}{p} - \frac{\sum_{i=1}^{y} F_i}{1-p} \right] = 0 \; (p(1-p)$$

$$(1-p) \sum_{i=1}^{y} M_i - p \sum_{i=1}^{y} F_i = 0$$

$$-1 \left(\sum_{i=1}^{y} M_i - p \sum_{i=1}^{y} M_i - p \sum_{i=1}^{y} F_i \right) = (0) - 1$$

$$-\sum_{i=1}^{y} M_i + p \sum_{i=1}^{y} M_i + p \sum_{i=1}^{y} F_i = 0$$

$$-\sum_{i=1}^{y} M_i + p \sum_{i=1}^{y} (M_i + F_i) = 0$$

$$p = \frac{\sum_{i}^{y} M_i}{\sum_{i}^{y} (M_i + F_i)}$$