Software tools for Maximum Likelihood Estimation

More Examples

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Evolving list of examples (check again)

- Age comp data
  - multinomial and Dirichlet-multinomial
- Code for other examples not yet described

Age comp example

- Constant recruitment and survival (necessary in example because the only type of data being used is age comps).
- Initially we assume we have good prior estimates of recruitment and assume they are known.

  - Alternatives

    - Estimate selectivity for each age forced to increase monotonically
    - Estimate selectivity via a logistic function

- multiple samples of age composition. Initially assumed to be multinomial, then Dirichlet multinomial

Model

$$N_a = R\exp(-Z(a-r)), r \le a \le \max$$

$$C_{i,a} = q_i S_a N_a$$

$$p_a = \frac{S_a N_a}{\sum_{j=r}^{\max} S_j N_j}$$

$$\underline{n}_i \sim \operatorname{multinom}\left(n_i, \underline{p}_a\right), n_i = \sum_{a=r}^{a=\max} n_{i,a}$$

Dirichlet-Multinomial

- Compound distribution, p vector comes from dirichlet then used as parameter of of multinomial.
- Used to introduce overdispersion relative to multinomial
- Using linear form where ESS proportional to sample size

$$\underline{n}_i \sim \mathrm{DirMult}(n_i, \underline{\alpha}_i), \alpha_{i,a} > 0$$

$$E\left(n_{i,a}\right) = n_i \frac{\alpha_{i,a}}{\sum_j \alpha_{i,j}}, ESS_i = \sum_a \alpha_{j,a}$$

$$\alpha_{i,a} = \theta n_i p_a, ESS_i = \theta n_i$$