NOTES

A SIMPLE METHOD OF ESTIMATING TOTAL MORTALITY RATE

Pauly (1983) and Alagaraja (1984) have proposed a variety of approaches for estimating the total mortality rate (Z) using the length frequency data. Ssentogo and Larkin (1973) have estimated Z making use of the probability distribution (*p.d.f.*) of age.

The p.d.f. of t (age) is given by

$$p(t) = Z e^{-Z(t-t_c)} \text{ for } t >= t_c$$

where p (t) is the probability of t

Z = the total instantaneous rate of mortality

t_c = age at first capture

From this, we obtain,

$$V(t) = 1/Z^2 \text{ for } t >= t_c \quad (1)$$

where V(t) is variance of t

Assuming the growth in length follows von Bertallanfy's Growth Formula (VBGF), we get,

$$t = t_o - 1/K \ln (1 - l_t / l\infty)$$

where, $l\infty$, K and t_o have their usual meaning. Thus,

$$V(t) = (1/K^2) V(y) \quad (2)$$

where V(y) is the variance of $\ln (l\infty - l_t)$

Substituting (2) in (1) we get,

$$Z^2 / K^2 = 1 / V(y) \text{ for } l >= l_c$$

where l_c is the length at first capture.

Hence $Z/K = 1/s.d(y)$

where, s.d(y) is the standard deviation of y.

The method is illustrated with the following example which is generated with $l\infty = 100$, K=0.5 and $Z = 1$.

Example

Length	Catch
30-35	250
35-40	309
40-45	320
45-50	389
50-55	352
55-60	315
60-65	278
65-70	241
70-75	203
75-80	167
80-85	130
85-90	93
90-95	55

Taking $l_c = 45$ we obtain, s.d(y) = 0.5059 for $l > l_c$ and $Z/K = 1/0.5059 = 1.9765$.

Since K=0.5 we have $Z = 0.5 \times 1.9765 = 0.988$

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References

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