# 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

$p(t) = Z e^{-Z(t-t_c)}$ 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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