The adequacy of aging techniques in vertebrates for rapid estimation of population mortality rates from age distributions

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DOI
10.1002/ece3.4854

Publication date
2019

Document Version
Other version

Published in
Ecology and Evolution

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Citation for published version (APA):
Appendix S6: Key mathematical notation

General notation

$F$: distribution functions

$f$: (probability) density functions

$\Phi(z)$: standard normal distribution function

$\phi(z)$: standard normal density function

Birth and survival related notation

$S$: survival time

$F_S(s)$: the distribution function of survival time $S$

$f_S(s)$: the density function of survival time $S$

$T$: time of birth of a random individual from the population

$f_T(t)$: the density function of time of birth $T$

$\tau$: the maximum possible age an individual from the population can attain

Linear regression related notation

$X$: age proxy

$X_1, ..., X_n$: independent and identically distributed copies of $X$

$x_1, ..., x_n$: realization of the random variables $X_1, ..., X_n$

$Y$: age

$f_Y(y)$: density function of the age of an individual at time 0

$g(y)$: regression function relating age proxy to age

$\alpha$: intercept for linear regression of age proxy against age

$\beta$: slope for linear regression of age proxy against age

$\sigma$: standard deviation of the error in the regression model

$\varepsilon$: standardized error in the regression model

$f_\varepsilon(z)$: density function for $\varepsilon$

$F_\varepsilon(z)$: distribution function for $\varepsilon$
n: sample size, i.e., the number of sampled individuals of which the age proxy is measured

**Mortality rate related notation**

m: mortality rate  
\[ \lambda = -\ln(1 - m) \]: rate parameter of exponential distribution  
\[ \beta / \sigma \]: the crucial indicator for the variation in estimated mortality rate  
\[ \mu = \sigma \lambda / |\beta| \]: proxy coefficient  
\[ \hat{\mu}_n \]: asymptotically efficient estimator of \( \mu \)  
I(\( m \)): Fisher information for mortality rate \( m \)  
J(\( \mu \)): Fisher information for \( \mu \)  
CR(95): 95% confidence range  
EP(95): theoretical 95% error percentage for mortality rate \( m \)  
EEP(95): empirical 95% error percentage for mortality rate \( m \)  
\[ \hat{m}_n \]: efficient estimator for mortality rate \( m \)  
\[ \frac{1}{m \sqrt{I(\( m \))}} \]: the basic factor used in the calculation of 95% error percentage EEP(95)