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

Appendix S6: Key mathematical notation

General notation

F: distribution functions

f: (probability) density functions

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

$\varphi(z)$: 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

τ: the maximum possible age an individual from the population can attain

Linear regression related notation

X: age proxy

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

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

Y: age

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

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

α: intercept for linear regression of age proxy against age

β: slope for linear regression of age proxy against age

σ: standard deviation of the error in the regression model

ε: standardized error in the regression model

$f_\varepsilon(\mathrm{z})$: density function for ε

$F_\varepsilon(\mathrm{z})$: distribution function for ε

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

β/σ: the crucial indicator for the variation in estimated mortality rate

$\mu = \sigma\lambda/|\beta|$: proxy coefficient

$\hat{\mu}_n$: asymptotically efficient estimator of μ

$I(m)$: Fisher information for mortality rate m

$J(\mu)$: Fisher information for μ

$CR(95)$: 95% confidence range

$EP(95)$: theoretical 95% error percentage for mortality rate m

$EEP(95)$: empirical 95% error percentage for mortality rate m

$\widehat{m}_n$: efficient estimator for mortality rate m

$\frac{\mathbf{1}}{\boldsymbol{m}\sqrt{\boldsymbol{I}(\boldsymbol{m})}}$**:** the basic factor used in the calculation of 95% error percentage $EEP(95)$