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

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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 \( T \)
\( \tau \): the maximum possible age an individual from the population can attain

**Linear regression related notation**

\( X \): age proxy
\( X_1, \ldots, X_n \): independent and identically distributed copies of \( X \)
\( x_1, \ldots, x_n \): realization of the random variables \( X_1, \ldots, X_n \)
\( Y \): 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 \(m\)  
\(\frac{1}{\hat{m}_n \sqrt{I(m)}}\): the basic factor used in the calculation of 95% error percentage \(EEP(95)\)