Functional Ecology

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The untapped potential of reptile biodiversity for understanding how and why animals age

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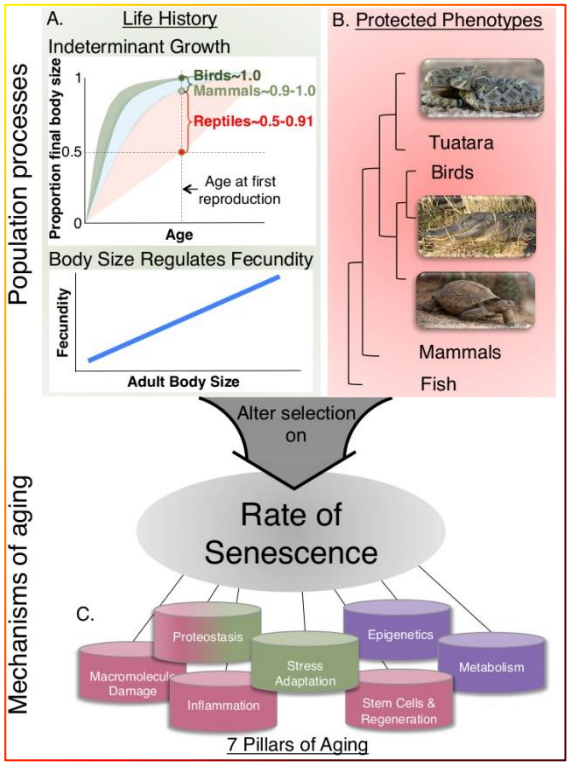
Reptiles include iconic examples of longevity, such as the Gálapagos tortoise, yet reptile aging is critically understudied. Compared to model organisms, we know little about how reptile populations age, or if and when reproduction declines. We review the existing literature on demographic aging in reptiles. We also examine how reptile life histories, specifically indeterminate growth and fecundity, coupled with the expression of protective traits predicts the evolution of slower aging in reptiles. Similarly, relatively little is known about the physiological, cellular, and molecular biology of reptile aging. We review what is known about mechanisms of reptile aging and place existing observations in the context of canonical "pillars of aging". These mechanistic pillars of aging include macromolecular damage, epigenetics, inflammation, adaptation to stress, proteostasis, stem cells and regeneration, and metabolism. We recommend four actions to fix the knowledge gap in our understanding of reptile aging: (1) extend and expand long-term population monitoring of reptiles, (2) develop reptile cell lines to aid cellular biology (3) conduct more comparative studies of reptile morphology and physiology sampled along relevant life-history axes and (4) sequence the genomes of more reptile species for comparative genomics. Given the diversity of reptile life histories and adaptations, advances in reptile aging biology will likely greatly benefit all aging biology.