

RESEARCH ARTICLE

Adaptive evolution and functional significance of the *PPARGC1A* gene across diverse animal species

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Abstract

Codon-based analyses of the *PPARGC1A* gene across 38 vertebrate species were deployed to elucidate patterns of evolutionary change. Employing maximum likelihood assessments through MEGA, we scrutinized 447 codon positions addressing the entire coding region, excluding positions mined by gaps or missing data. Distinct codons manifested variance in selection pressures, particularly codons 4, 11, 66, and 123, which exhibited positive dN-dS values suggestive of positive selection. Codon 137 displayed the most pronounced dN-dS value, signifying intensified selective advantage. Meanwhile, codons 30 and 90 portrayed near-neutral scores, indicative of purifying selection. Complementary computational methods (iFEL, REL, FUBAR, and SLAC) confirmed positive selection at specific codon sites, with varying degrees of corroboration. The integration of mixed-effect modeling (MEME) identified episodic diversifying selection, pinpointing codons that underwent selection episodes in certain lineages. Refined codon model selection lent insight into substitution rates, revealing nuanced degrees of evolutionary conservation among different codons. Supporting these genetic insights, the phylogenetic analysis highlighted relationships among the *PPARGC1A* sequences and domain analysis confirmed conserved features across species, while protein-protein interaction networks suggested a complex web of functional interdependencies. These findings advance our understanding of the *PPARGC1A* gene's evolutionary trajectory and underscore the gene's potential adaptive significance within diverse vertebrate lineages.

KEYWORDS

adaptive evolution, maximum likelihood, positive selection, *PPARGC1A* gene

TAXONOMY CLASSIFICATION

Conservation ecology, Conservation genetics, Evolutionary ecology, Phylogenetics

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Functional Anatomy Adaptive Evolution

K Morrison



Functional Anatomy Adaptive Evolution:

Functional Anatomy Adaptive Evolution Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has are more apparent than ever. Its power to stir emotions, provoke thought, and instigate transformation is truly remarkable. This extraordinary book, aptly titled "**Functional Anatomy Adaptive Evolution**," published by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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