

Convergent genome evolution shaped the emergence of terrestrial animals

Description

The challenges associated with the transition of life from water to land are profound, yet they have been met in many distinct animal lineages. These constitute a series of independent evolutionary experiments from which we can decipher the role of contingency versus convergence in the adaptation of animal genomes. Here the authors compare 154 genomes from 21 animal phyla and their outgroups to reconstruct the protein-coding content of the ancestral genomes linked to 11 animal terrestrialization events, and to produce a timescale of terrestrialization. The authors uncover distinct patterns of gene gain and loss underlying each transition to land, but similar biological functions emerged recurrently, pointing to specific adaptations as key to life on land. It is shown that semi-terrestrial species evolved convergent functional patterns, in contrast with fully terrestrial lineages that followed different paths to land. The reported timeline supports three temporal windows of land colonization by animals during the last 487 million years, each associated with specific ecological contexts. Although each lineage exhibits distinct adaptations, there is strong evidence of convergent genome evolution across the animal kingdom, suggesting that, in large part, adaptation to life on land is predictable, linking genes to ecosystems.

Category

1. News