UNCERTAIN PHYLOGENETIC RELATIONSHIPS AS A SOURCE OF ERROR IN THE TRACKWAY-DATA-BASED RECONSTRUCTION OF LOCOMOTION EVOLUTION WITHIN AMNIOTE ANCESTORS

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Some of the variability among Carboniferous to early Permian tetrapod tracks can be attributed to evolutionary changes in trackmaker anatomy and locomotion style close to the origin of amniotes. We have suggested an ancestral state reconstruction approach as a method to utilize trackway data to infer steps of evolutionary change: Based on measurements of trackways referred to common late Paleozoic ichnotaxa, correlation of these ichnotaxa with certain groups of amniote and related non-amniote trackmakers according to imprint morphology, and known skeletal-morphology-based phylogenies of the supposed trackmakers, we inferred ancestral states for functionally controlled trackway measures in a maximum likelihood approach. However, apart from uncertainties in the trackmaker assignment of Carboniferous track types, the controversial phylogenetic relationships among crucial tetrapod groups poses a serious challenge to the reconstruction of locomotion evolution, most notably (1) the relative position of seymouriamorphs and lepospondyls within the stem-group of amniotes, (2) the position of diadectomorphs – as the sistergroup to all amniotes or as a monophyletic or paraphyletic group on the synapsid branch of amniotes, (3) the placement of varanopids within synapsids or eureptiles. Thus, we have reconstructed ancestral states of trackway measures for several alternative phylogenetic hypotheses, including those named above, to derive robust hypotheses of evolutionary change that are in agreement with each of the assumed phylogenies. Accordingly, our earlier assumption of a body-size-increase-related locomotion change within the ancestors of amniotes (but also the suitability of *Orobates* as a model taxon for the last common ancestor of amniotes) relies quite much on the placement of diadectomorphs. A small-bodied, crawling salamander- to lizard-like last common ancestor to all amniotes remains a plausible alternative according to some scenarios and cannot yet be ruled out with certainty.