The current state of the field in using continuous shape data for phylogenetic reconstruction: A systematic review.

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Discrete morphological data are often important in traditional systematic methods for phylogenetic reconstruction and are crucial for merging fossils into the tree of life, calibrating molecular dating and enhancing accuracy in phylogenetic inference. However, a major limitation of discrete morphological data is subjectivity in character/character state definition. Quantitative data e.g., geometric morphometric (GMM; shape) data can allow for more objective integration of morphology into phylogenetic inference. This review describes the current state of the field in using continuous shape data for phylogenetic reconstruction using the PRISMA-EcoEvo v1.0. reporting guideline, and offers pathways for approaching this task with GMM data. A comprehensive search string yielded 12,062 phylogenetic studies published in English up to Aug 2023 in the Web of Science database. Title/abstract screening removed 11,907 articles and full-text screening was performed for 143 articles. Topologies reconstructed using GMM were compared to those using discrete morphological data. Most phylogenies did not show increased support and resolution with the inclusion of continuous data, as either continuous-only morphological datasets, or integrated into discrete morphological datasets. Despite the ongoing rarity of such studies, improved methods for the application of quantitative data to phylogenetic inference remain crucial to the advancement of morphological phylogenetics.

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