**Abstract**

Differences in polychaete musculature lead to distinct burrowing behavior. We characterize the anatomy and functional properties of the burrowing mechanism of the tube-dwelling polychaete Terebellidae. Morphotaxonomic analyses reveal anatomical differences among species, which are consistent with the morphological diversity observed in the literature. Evolutionary history indicates that the family Terebellidae emerged during the Jurassic, and that the burrowing mechanism has been conserved through the Cretaceous and Cenozoic eras. The burrowing mechanism is complex, involving multiple muscles and a specialized set of body segments, which work in concert to generate a coherent force that propels the animal forward. The muscles are classified as either oblique or longitudinal, depending on their orientation relative to the body axis. The oblique muscles are responsible for the propulsion of the animal, while the longitudinal muscles provide stability and support. The burrowing mechanism is unique to the Terebellidae and is not found in other polychaete families. The evolutionary history of the burrowing mechanism provides insight into the adaptation of polychaetes to their environment, and highlights the importance of evolutionary history in understanding the diversity of polychaete behavior.