28-8 - FLEXIBILITY IN THE VERTEBRAL COLUMN OF THE ANCIENT WHALE *GEORGIACETUS VOGTLENSIS*

Saturday, 18 March 2023

8:00 AM - 12:00 PM

Grand Ballroom A–D (Hyatt Regency Reston)

Booth No. 18

Abstract

Georgiacetus vogtlensis is a 41-million-year-old archaeocete (ancient whale) from the southeastern coast of North America. Sitting just outside of the clade Pelagiceti (fully-aquatic cetaceans), it exhibits characteristics associated with both a semi- and fully-aquatic lifestyle, including the robust pelvis of a terrestrial mammal and the lack of bony articulation between the pelvis and vertebral column like a fully-aquatic mammal. *Georgiacetus* is generally interpreted as semi-aquatic, swimming via dorsoventral undulation of the post-thoracic vertebrae with some propulsion from the hind limbs. A previous study on *Georgiacetus* documented morphological changes to the lumbar vertebrae associated with increased dorsoventral mobility. However, features in posterior lumbar vertebrae indicated increased stability, which may suggest regional specialization in this part of the spine. Here we adopt a method of quantifying intervertebral flexibility in the artiodactyl vertebral column developed in a prior study. *Georgiacetus* retains features of artiodactyl vertebral morphology absent in modern cetaceans, allowing for comparison between it and terrestrial artiodactyls. In this method, thoracic (T), lumbar (L), sacral (S), and caudal (Ca) vertebrae are sorted into functional groups based on morphology of articulation. Fourteen measurements are collected from each vertebra and applied to specialized trigonometric formulae that quantify the amount of sagittal bending on a dry skeleton. Preliminary analyses of 8 joints in the vertebral column of *Georgiacetus* (T5-T6, T6-T7, L1-L2, L7-L8, L8-S1, S1-S2, S3-S4, and S4-Ca1) indicate an overall increase in degree of sagittal bending from the T5-T6 joint to the S4-Ca1 joint, with the greatest range of motion at the S1-S2 joint. No substantial differences in sagittal mobility are evident from the anterior to the posterior lumbar region, counter to expectations. Additional analyses quantifying the degree of lateral bending and axial rotation will be conducted to better understand the range of motion in the *Georgiacetus* vertebral column and the functional implications for its swimming capabilities.

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