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Southeastern Section - 65th Annual Meeting (31 March–1 April 2016)

Paper No. 22-6

Presentation Time: 10:00 AM

INSIGHTS INTO THE LOCOMOTOR MODE OF THE ANCIENT WHALE *GEORGIACETUS* BASED ON VERTEBRAL MORPHOLOGY

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Georgiacetus vogtlensis is one of the most primitive archaeocetes (ancient whales) from North America. Discovered in middle Eocene deposits of the northern Atlantic Coastal Plain of Georgia in 1983, it shows important adaptations toward fully aquatic behavior, including lack of articulation between the pelvis and sacral vertebrae. It also exhibits characteristics similar to semi-aquatic mammals, including a sizable pelvis. *Georgiacetus*, which is closely related to but not a member of the clade Pelagiceti (fully aquatic whales), is ideal for investigating skeletal changes associated with the land-to-sea transition evident in whale evolution. Lumbar vertebrae underwent drastic changes during this transition, as dorsomobile whales evolved from dorsostable artiodactyls and locomotion via hindlimb propulsion (for semi-aquatic whales) was replaced by locomotion via vertebral undulation (for fully aquatic whales). Thirteen measurements of vertebral morphology were collected from the two anterior-most (L1 and L2) and two posterior-most (LY and LZ) lumbar vertebrae of over 30 extant and extinct terrestrial, aquatic, and semi-aquatic mammals, including *Georgiacetus*. Separate principal components analyses (PCA) were conducted for each vertebral position (L1, L2, LY, and LZ) using these measurements and specimens. All four PCAs sorted specimens by vertebral mobility, and all four placed *Georgiacetus* between known dorsostable and known dorsomobile mammals. Separate discriminant function analyses (DFA) were also conducted for each vertebral position for fully and semi-aquatic specimens, using the same measurements and treating *Georgiacetus* as an unknown. DFA of L1 and L2 categorized *Georgiacetus* as semi-aquatic, but DFA of LY and LZ characterized *Georgiacetus* as fully aquatic. Because fully aquatic whales locomote via vertebral undulation, categorization of the posterior-most lumbar vertebrae of *Georgiacetus* as fully aquatic suggests an increasing reliance on vertebral undulation as its primary mode of locomotion, which in turn suggests a primarily aquatic lifestyle for this genus.

Session No. 22

T14. Fossil Vertebrates of the Southeastern United States

Friday, 1 April 2016: 8:00 AM-12:00 PM

Richland B (Columbia Metropolitan Convention Center)

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