ACTA PALAEONTOLOGICA POLONICA

Osteology of the dorsal vertebrae of the giant titanosaurian sauropod dinosaur *Dreadnoughtus schrani* from the Late Cretaceous of Argentina

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Acta Palaeontologica Polonica 62 (4), 2017: 667-681 doi:https://doi.org/10.4202/app.00391.2017

Many titanosaurian dinosaurs are known only from fragmentary remains, making comparisons between taxa difficult because they often lack overlapping skeletal elements. This problem is particularly pronounced for the exceptionally large-bodied members of this sauropod clade. *Dreadnoughtus schrani* is a well-preserved giant titanosaurian from the Upper Cretaceous (Campanian–Maastrichtian) Cerro Fortaleza Formation of southern Patagonia, Argentina. Numerous skeletal elements are known for *Dreadnoughtus*, including seven nearly complete dorsal vertebrae and a partial dorsal neural arch that collectively represent most of the dorsal sequence. Here we build on our previous preliminary description of these skeletal elements by providing a detailed assessment of their serial positional assignments, as well as comparisons of the dorsal vertebrae of *Dreadnoughtus* with those of other exceptionally large-bodied titanosaurians. Although the dorsal elements of *Dreadnoughtus* probably belong to two individuals, they exhibit substantial morphological variation that suggests that there is minimal, if any, positional overlap among them. *Dreadnoughtus* therefore preserves the second-most complete dorsal vertebral series known for a giant titanosaurian that has been described in detail, behind only that of *Futalognkosaurus* . The dorsal sequence of *Dreadnoughtus* provides valuable insight into serial variation along the vertebral column of these enormous sauropods. Such variation includes the variable presence of divided spinodiapophyseal laminae and associated spinodiapophyseal fossae. Given that dorsal vertebrae are the only elements that overlap between known remains of most giant titanosaurian taxa, the dorsal series of *Dreadnoughtus* provides a means to directly compare the morphologies of these sauropods. The dorsal vertebrae of *Dreadnoughtus* and *Futalognkosaurus* have dorsoventrally narrow transverse processes, unlike the condition in *Puertasaurus* . Further, *Dreadnoughtus* and *Argentinosaurus* have ventromedially inclined prezygapophyses, whereas *Futalognkosaurus* has almost horizontal prezygapophyses. The continued inclusion of new, well-represented skeletons of titanosaurians such as *Dreadnoughtus* in phylogenetic and functional morphological studies will aid in deciphering the interrelationships and paleobiology of Titanosauria.

Key words: Sauropoda, Titanosauria, *Dreadnoughtus*, dorsal vertebrae, Cretaceous, Cerro Fortaleza Formation, Argentina.

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