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burrows in the Aztec Sandstone. They occur at two localities in Valley of Fire State Park, and at one locality in Gold Butte National Monument, both of which are in southern Nevada.

In Valley of Fire S.P. the best exposed burrow is nearly straight, oriented N45°W, with a terminal chamber at the northwestern end (Figure 1). The burrow is 8.5 cm wide and 7.5 to 8.5 cm thick. It is 3.4 m long, although the southeastern end has been partially removed by erosion, so the original length is unknown. This burrow lies approximately parallel to the laminae of the sandstone, near the base of a cross-bedded set. It was originally horizontal, or possibly slightly inclined upward, in the direction of the terminal chamber. This burrow was preferentially cemented, so it has weathered out in three-dimensional relief. A morphologically similar, but less well exposed burrow was discovered a few hundred meters away from this one, in the same area within the park.

The dimensions and simple non-branching architecture of these two Valley-of-Fire burrows compare favorably with "Type II" burrows of Riese et al. (2011) in the Navajo Sandstone of southeastern Utah. Those authors suggested that their "Type II" burrows were excavated by large tritylodontid therapsids. Rowland and Mercadante (2014) reported the occurrence of abundant vertebrate tracks at one Valley of Fire locality which they also attributed to tritylodontids.

In Gold Butte National Monument another set of vertebrate burrows has been identified, and these are very different from the Valley of Fire burrows. The Gold Butte burrow complex consists of a cluster of variously oriented, cylindrical sandstone structures, each of which is 7-9 cm in diameter. Two of the cylinders are oriented at a very steep angle, another is approximately horizontal, while others plunge at different angles. All of the cylinders appear to roughly converge toward an unexposed region which we interpret to have been a chamber. As in the case of the Valley of Fire burrows, these rock cylinders stand out in three-dimensional relief, due to preferential cementation.

Figure 1. Burrow in the Aztec Sandstone in Valley of Fire State Park. The calibrated rod is 1.5 m long, calibrated in decimeters.

The morphology of this Gold Butte burrow complex compares favorably with "Type 1" burrows of Riese et al. (2011) in the Navajo Sandstone of southeastern Utah. The taxonomic affinity of the burrowers is unknown.

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Technical Session 3: Terrestrial Ecosystems – Late Jurassic (Friday, June 9, 2023, 1:30 PM)

REVIEW OF *DRACOPELTA ZBYSZEWSKII*, AN ANKYLOSAUR FROM THE UPPER JURASSIC OF PORTUGAL

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Ankylosaurs are one of the most iconic groups of dinosaurs. Their most conspicuous characters are the pervasive parasagittal dermal ossification, heavily ornamented, hyperossified skull, and, in ankylosaurines, fusion of the posterior half of the tail, forming the recognizable tail club. Fossils ascribed to Ankylosauria have been identified worldwide, dating at least from the Middle Jurassic to the latest Cretaceous. While in the Cretaceous ankylosaurs achieve maximum diversity and a ubiquitous presence in terrestrial ecosystems, in the Jurassic, occurrences are rare and often fragmentary, and predominantly restricted to Laurasia (Arbour & Currie, 2015; Francischini et al., 2017; Kirkland et al., 1998; Maidment et al., 2021; Rosa et al., 2018). The earliest known ankylosaurs, such as *Sarcolestes leedsi* Lydekker 1893, from the middle Callovian of England, or *Tianchisaurus nedegoapeferima* Dong 1983, from the Bathonian-Callovian of China, are known from a handful of specimens, usually too fragmented or incomplete to provide a solid diagnosis and reliable phylogenetic positioning. The Upper Jurassic has a more complete record, with most of the known specimens from the Morrison Formation, USA, although belonging to just two genera, *Mymoorapelta maysi* Kirkland and Carpenter 1994, and *Gargoyleosaurus parkpinorum* Carpenter et al. 1998 (Carpenter et al., 1998; Kilbourne & Carpenter, 2005; Kirkland & Carpenter, 1994; Kirkland et al., 1998).

The Upper Jurassic of Portugal has an extensive and well documented dinosaur fossil record, and the Lourinhã Formation (late Kimmeridgian-latest Tithonian/?earliest Berriasian) shows a close paleoecological relationship with the approximately coeval Morrison Formation, expressed in the closely related dinosaur taxa, such as the genera *Torvosaurus*, *Allosaurus*, *Ceratosaurus*, *Supersaurus*, *Miragaia*, and *Stegosaurus* (e.g., Antunes & Mateus, 2003, 2006; Costa & Mateus, 2019; Hendrickx & Mateus, 2014; Lapparent & Zbyszewski, 1957; Malafaia et al., 2014, 2017; Mateus et al., 2006; Tschopp et al., 2015). However, the presence of ankylosaurs has been restricted to the poorly known *Dracopelta zbyszewskii* Galton 1980, dated from the upper Tithonian (Galton, 1980, 1983; Pereda-Suberbiola et al., 2005; Russo & Mateus, 2021). Despite being first considered as a likely nodosaurid, *Dracopelta* has consistently been regarded as an ankylosaur of uncertain affinities, or even as a *nomen dubium*, due to the often-considered undiagnostic characteristics of the holotype (Carpenter, 2001; Pereda-Suberbiola et al., 2005; Vickaryous et al., 2004). Here we revisit the holotype specimen (MG5787), and redescribe it in detail, including hitherto unknown elements of the axial skeleton, such as a partial right hindlimb, composed of a partial femur, tibia, fibula, and articulated autopodium (MG 3), which is reidentified as a right pes, as well as a reassessment of the type locality. Additionally, we describe a new, mostly complete, articulated specimen of *D. zbyszewskii*, recovered from the coastal cliffs one kilometer North from the beach of Porto da Calada, Mafra, about 40 km North of Lisbon, dated from the uppermost Tithonian (~ 145 Mya). It consists of a nearly complete skull, left mandible, complete articulated cervical and dorsal vertebral series, sacrum, and 13 caudal vertebrae, articulated and disarticulated ribs, pectoral and partial pelvic girdles, left humerus, femora, and abundant *in situ* and displaced dermal armor. This specimen is the most complete dinosaur in Portugal and the most complete ankylosaur from the Jurassic. The new material (FCT 702) shares at least six unique characters with the holotype, such as the anteriorly placed lateral processes of the dorsal vertebrae, dermal armor arrangement of rows of parasagittal circular ossicles, dorsolateral keeled scutes, and dorsal keeled lateral plates, or a double pair of cervicodorsal medial semicircular keeled ossicles, with thickened rims. This allows us to conclusively attribute this second specimen to *D. zbyszewskii*. Thus, we rediagnose *D. zbyszewskii* based on a unique combination of characters, including nine autapomorphies: maxillary tomial crest medially deflected at the premaxillary/maxillary contact, completely separating the buccal emargination from the premaxillary palate, anteriorly narrow tooth rows relative to the posteriormost width of the tooth row (strongly concave), transverse processes of the cervical and dorsal vertebrae located anteriorly, at the edge of the anterior articulation facet of the centrum, two dorsolaterally positioned bilateral bundles of three ossified tendons, deeply excavated intertrochanteric and intercondylary fossae of the femur, medial femoral condyle twice the size of the lateral condyle, three cervical bands of armor made up of coossifed osteoderms forming quarter rings, dermal armor arrangement of rows of four dorsal parasagittal subcircular ossicles, dorsolateral keeled scutes, and lateral dorsally keeled plates, and two pairs of cervicodorsal medial semicircular keeled ossicles, with thickened rims. To clarify its position, phylogenetic analyses were performed using both maximum parsimony and Bayesian inference approaches, with *D. zbyszewskii* consistently recovered as sister taxa of *G. parkpinorum*, from the Upper Jurassic of Morrison Formation, USA, in a basal ankylosaur group that also includes the other Morrison Formation ankylosaur, *M. maysi*, as the sister taxa to the grouping of *D. zbyszewskii* + *G. parkpinorum*. These results add a new datapoint from a hitherto untested clade, which further reinforces the close relationship between Late Jurassic Portuguese and North American dinosaur faunas. Moreover, *D. zbyszewskii* is restricted to the topmost part of the Lourinhã Formation (Upper Tithonian), slightly younger than its American

counterparts (~145 Mya vs. ~ 148-152 Mya). Paleobiogeographically, this may be indicative of a secondary land connection and dispersal event (in the Tithonian) between North America and Iberia.

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