**Introduction**

Dimetrodon, a “pelycosaur” grade synapsid, was the apex predator of the Early to Middle Permian. Easily recognized by tall neural spines and large coniform teeth, this ancient relative of therapsids, and later mammals, is widely categorized with sprawling posture despite how derived it is from basal synapsids. (Romer, 1940). The spine of Dimetrodon exhibits limited lateral flexibility and trackways attributed to the organism lack body dragging marks, implying our understanding of its locomotion is outdated. (Kemp, 2005; Hunt and Lucas, 1999). By studying the functional morphology of the forelimb and hindlimb of Dimetrodon compared to that of extant reptiles and mammals, I seek to better quantify its locomotion across the spectrum of sprawling to upright posture.

**Questions**

Did Dimetrodon truly have sprawling posture?

Can postural grade and/or femoral abduction angle be estimated for fossil taxa from limb dimensions and pace angulation?

Does femoral abduction angle rather than discrete postural grade better inform transitions in locomotion? (Gatesy, 1991)

**Methods**

Collected data:
1. Linear measurements of 58 continuous variables of girdles, zeugopoda, and stylopoda of 23 extinct taxa (11 mammals, 12 reptiles) and Dimetrodon (Bock, 2004)
2. Pace angulations for same 23 extant species and ichnogenus Dimetropus (Kubo and Benton, 2009)
3. Femoral abduction angles for 7 extant species

**Stats:**
1. Discriminant function analysis (DFA) on limb dimensions and pace angulation of extant species to predict that of Dimetrodon
2. Multiple regression of 7 extant taxa with known femoral abduction angles to predict that of Dimetrodon

**Results**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Standardized Coefficient</th>
<th>Standard Error</th>
<th>t Statistic</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. sprawling</td>
<td>0.23</td>
<td>0.05</td>
<td>4.78</td>
<td>&lt;0.0001</td>
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<tr>
<td>2. pace angle</td>
<td>-0.34</td>
<td>0.07</td>
<td>-4.88</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>3. femoral abduction angle</td>
<td>0.31</td>
<td>0.06</td>
<td>5.14</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Graph of 4 variable DFA of extant taxa with Dimetrodon. Variables shown are best predictors of postural grade. Plot shows Dimetrodon grouping with dual-gait taxa, overlapping directly over Caiman crocodilus. Sprawling taxa are loosely clustered, dual-gait are well-clustered, and upright taxa are fairly clustered. The sprawling taxa within the upright taxa is the monotreme Tachyglossus anatinus. The two sprawling taxa closest to the dual-gait taxa are Tupinambis teguixin, Varanus komodoensis, and Varanus eranthermochoric.

**Future Work**

- Collect data from a wider number and variety of modern taxa and reduce the number of variables
- Expand list of taxa with known femoral abduction angles
- Take phylogenetic relationships of taxa into account during further analysis
- Expand fossil taxa to basal “pelycosaurs” and therapsids
- Apply these methods to other groups such as extinct archosauromorphs

**References**


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